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The Effects of a Concentrated Physical Education Program and an Auditory and Visual Perceptual Reading Program Upon Academic Achievement, Intelligence, and Motor Fitness of Educable Mentally Retarded Children.

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THE EFFECTS OF A CONCENTRATED PHYSICAL EDUCATION PROGRAM AND AN AUDITORY AND VISUAL PERCEPTUAL READING PROGRAM UPON ACADEMIC ACHIEVEMENT, INTELLIGENCE, AND MOTOR FITNESS OF EDUCABLE MENTALLY RETARDED CHILDREN.

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Louisiana State University and
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The Department of Health, Physical and Recreation Education

by
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ABSTRACT

The purpose of this study was to determine the effects of a concentrated physical education program and a program of auditory and visual perceptual reading upon academic achievement, intelligence and motor fitness of educable mentally retarded junior high school boys and girls.

Forty educable mentally retarded junior high school boys and girls enrolled in special education classes in the East Baton Rouge Parish School System were subjects in this study, which was conducted during the fall and spring semesters of 1968-1969 at Louisiana State University, Baton Rouge, Louisiana.

Thirty subjects were initially selected from Prescott Junior High School and randomly assigned to one of three experimental groups. Ten subjects were randomly selected from Glen Oaks Junior High School to serve as the control group. The groups and final number of subjects in each were as follows: (1) Group I (five boys and five girls), in a combined program of eighty minutes of concentrated physical education, and eighty minutes of auditory and visual perceptual reading training; (2) Group II (five boys and five girls), in a program of eighty minutes of concentrated physical education and eighty minutes of classroom instruction; (3) Group III (four boys and five girls), eighty minutes of auditory and visual perceptual reading and eighty

minutes of classroom instruction; (4) Group IV (five boys and four girls), instructed in a special education class during a regular five hour school day.

The data collected included scores obtained from the Gates-MacGinitie Reading Achievement Tests, which included two tests: Vocabulary and Comprehension; The Wide Range Achievement Test (WRAT), which consisted of arithmetic and spelling test; Wechsler Intelligence (total) Full Scale Tests for Children and Adults; and a Motor Fitness Test which included a battery of ten motor fitness tests.

To determine the effectiveness of concentrated instruction in physical education, the effectiveness of concentrated instruction in auditory and visual perceptual reading, and the interaction effects of physical education and auditory and visual perceptual reading with regards to academic achievement, a two-by-two factorial analysis of covariance was used, and a two-by-two factorial analysis of variance was employed for intelligence quotients and motor fitness scores.

Results of this investigation indicated the following conclusions:

1. Physical education does not contribute significantly to improvement in selected academic areas.
2. No significant improvement was made in the academic areas studied in an auditory and visual perceptual reading program.

3. Improvement in reading vocabulary was significantly greater without an auditory and visual perceptual reading program than with such a program when comparisons were made.
4. Intelligence quotients, as measured in this study, can be significantly improved in concentrated programs of physical education.
5. No significant increases in intelligence quotients were made in an auditory and visual perceptual reading program.
6. Programs of concentrated physical education specifically designed for educable mentally retarded children are significantly better in improving total motor fitness than are existing physical education programs.
7. Significant improvement in the academic areas of reading comprehension and arithmetic can be made in a combined program of concentrated physical education and auditory and visual perceptual reading.
8. The traditional five hours of instruction in a special education class was significantly better when comparisons were made than other programs studied in improving reading vocabulary.
9. In the academic areas of reading comprehension and arithmetic the traditional five hour a day school program revealed significant improvement.

CHAPTER I

INTRODUCTION

The statement, "All men are created equal," has perhaps become trite, but it still has important meaning for education in a democratic society. Although it was used by the founding fathers to denote equality before the law, it has also been interpreted to mean equality of opportunity. This implies educational opportunity for all children, whether they are average, bright, dull, retarded, blind, crippled, emotionally disturbed, or otherwise deviant, to receive help in learning to the limits of their capacity, and an opportunity for a fit productive life in society.[1]

Scientific and technological advances of the Twentieth Century have accentuated major problems in American society. Recent developments have emphasized the concern of governmental officials for these problems. President John F. Kennedy,[2] through the Council on Youth Fitness, directed school board members, school administrators, teachers, and pupils themselves to heed ". . . this urgent

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[1]Samuel A. Kirk, Educating Exceptional Children (Boston: Houghton-Mifflin Company, 1962), 415 pp.

[2]John F. Kennedy, A Presidential Message to the Schools on the Physical Fitness of Youth. "Youth Physical Fitness: Suggested Elements of a School-Centered Program," President's Council on Youth Fitness, (Washington, D.C.: U. S. Government Printing Office, 1961).

call to strengthen all programs which contribute to the physical fitness of our youth . . ." President John F. Kennedy charged his Panel on Mental Retardation with:

> . . . the responsibility . . . to explore the possibilities and pathways to prevent and cure mental retardation. No relevant discipline and no fact that will help achieve this goal is to be neglected."[3]

A close examination of the average American school reveals an increasing number of children with varying physical and psychological disabilities. Authorities, such as Fait,[4] have stated that "between five and ten per cent of the school population suffer from some type of physical or mental deficiency requiring special education consideration."

Body and mind are never independent. Though much remains to be learned about the brain and central nervous system, neurologists, in general, agree that the idea of two lives, psychic and somatic, has outlived its usefulness. The psychosomatic concept in medicine recognizes this fact of biological integration and acknowledges its significance.[5]

The early motor explorations of the child begin a long

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[3]John F. Kennedy, "A National Plan to Combat Mental Retardation," President's Panel on Mental Retardation (Washington, D.C.: U. S. Government Printing Office, 1962). Of 628369.

[4]H. F. Fait, Adapted Physical Education (Philadelphia: W. B. Saunders Company, 1962), p. 21.

[5]A. H. Ismail, and J. J. Gruber, Motor Aptitude and Intellectual Performance (Columbus, Ohio: Charles E. Merrill, Inc., 1967), p. 2.

process of development, growth, and learning by which the child finds out about himself and the world around him. Motor experimentation and motor learning become the foundations upon which this knowledge is built, and the base upon which the entire personality of the child rests. In early childhood, mental and physical activities are closely related, and these motor activities may play a major role in intellectual development. Muscular activity and movement are necessary for the maintenance, growth, and development of the various organs and systems of the human body. To a large extent, higher forms of behavior develop out of and have their roots in, motor learning; ". . . motor learning can be regarded as playing a very significant part in almost any endeavor of human concern."[6] Dutton[7] stated that physical vitality promotes mental vitality, and this is essential to academic achievement. Comenius noted, "Intellectual progress can be conditioned at every step by bodily vigor."[8]

By investigating the world through movement, a child learns to interpret these perceptual patterns in terms of information

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[6]Julian U. Stein, "Motor Function and Physical Fitness of the Mentally Retarded: A Critical Review," Rehabilitation Literature, XXIV (August, 1963), 230-238.

[7]Richard E. Dutton, "Physical Fitness and the Professor," The Physical Educator, 24:27-29, March, 1967.

[8]Charles A. Bucher, "Health, Physical Education and Academic Achievement," National Education Association Journal, 54:38-40, May, 1965.

meaningful to him and information which can be used to influence his behavior in a way that more veridical and more efficient responses occur. Through exploratory movements, the child on one hand generates perceptual information, and on the other hand relates this information to himself and his activities. It is through such exploration that input information is correlated with output behavior. A child builds a heirarchy of systematic knowledge based upon the foundation of his physical interaction with his environment. The importance of an adequate motor interaction therefore becomes apparent.[9] Performances of motor skills are dependent upon continuous feedback from the auditory, visual, muscular, and joint senses, so perceptual processes are an integral part of any motor activity.[10]

It could be expected that the child whose motor responses were inadequate would express difficulty in building up such systematic bodies of information and, as a result, would show limitations in learning as measured by achievement measures, and perhaps in intelligence. ". . . if attention to motor responses can lead to improvement in learning achievement, then an approach to the problem through education is suggested."[11]

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[9]A. H. Ismail, and J. J. Gruber, loc. cit.

[10]Ruth B. Glasscow, "Improvement of Motor Development and Physical Fitness in Elementary School Children," (Cooperative Research Project No. 696, Microcard P. E. 708, p. 82, U. S. Office of Education, 1966).

[11]Ismail and Gruber, op. cit., p. vii.

> Few contemporary publications have been concerned with the play, physical education, recreation, physical fitness, or motor function of the mentally retarded to the same degree that they have dealt with other aspects of their behavior and function.[12]

I. STATEMENT OF THE PROBLEM

What will be the effects of concentrated daily instruction in physical education and in auditory and visual perceptual reading on academic achievement, intelligence, and motor fitness?

II. PURPOSE OF THE STUDY

The purpose of this study was to determine the effects of (1) a combined program of concentrated physical education and auditory and visual perceptual reading; (2) a concentrated physical education program and classroom instruction program in arithmetic, language arts (writing, spelling, and grammar), science and health; (3) an auditory and visual perceptual reading program and classroom instruction program in arithmetic, language arts (writing, spelling, grammar), science, and health; and (4) a five hour a day school program with no specific physical education program for educable mentally retarded children, or a special perceptual reading program upon academic achievement, intelligence and motor fitness among educable mentally retarded junior high school boys and girls.

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[12]Stein, op. cit., p. 230.

III. NEED FOR THE STUDY

With programs for the mentally handicapped becoming more and more common, the implications for using physical activities to assist in meeting the needs of the retarded are tremendous. Disciplines concerned with this growing segment of our population should fully exploit the potential of games, movement, sports, rhythms, and other facets of physical activities to develop a better understanding and theoretical base for exploring, or perhaps changing, the behavior of the mentally retarded. Physical educators and educators in general need to be cognizant of the importance of motor function and physical fitness in the growth, development, and learning of the mentally retarded. Physical education, perhaps, should be recognized and interpreted in its broadest sense as a positive force in programs for the mentally retarded.[13]

Scientifically executed experimental research is needed to shed more light on many questions in the area of the mentally retarded. The effects of different types of program placement, time allotments, specific activities, and various methods and techniques need investigation. Stein expressed the need for differential studies with the mentally retarded in all possible situations; regular school classes, special classes in regular schools, and special day classes.[14] It was believed that this study may assist

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[13]Stein, loc. cit. [14]Stein, op. cit., p. 241.

and enable personnel working with this population to plan, develop, organize, and administer programs that will better meet the needs, abilities, and limitations of groups of mentally retarded children.

IV. LIMITATIONS OF THE STUDY

The subjects in this study were limited to forty educable mentally retarded junior high school boys and girls enrolled in special education classes in East Baton Rouge Parish schools in the fall of 1968. These subjects were between thirteen and seventeen years of age. The selection of the subjects was also limited to two junior high schools in East Baton Rouge Parish, Louisiana. These junior high schools were Prescott Junior High School and Glen Oaks Junior High School. Thirty subjects were randomly selected from Prescott Junior High School and ten subjects were selected at random from Glen Oaks Junior High School. This study was also limited to four groups of ten subjects in each group, which included five girls and five boys in each of the four groups.

The study was further limited to those subjects who had not had any organized daily physical education program previously or an auditory and visual perceptual reading training program. No attempt was made to eliminate from the study any of the subjects who were physically handicapped. However, those subjects who were not able to perform on any one of the administered tests, due to

visual impairment or other physical handicaps, were excluded only from that particular test.

V. DEFINITION OF TERMS

The terms basic to this study were defined as follows:

Academic achievement was defined as the performance of the subjects in the academic areas of reading, language, spelling, and arithmetic.[15]

Chronological age (CA) was age in years and months.[16]

Educable mentally retarded children (EMR) was defined as those with potentialities for development in (1) maximum educability in the academic subjects of the school; (2) social adjustment to such a point that they can get along independently in the community; and (3) minimum occupational adequacy to such a degree that they can later support themselves fully or partially, at the adult level.[17]

Existing physical education program was used in this study to denote programs of physical education participated in by the

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[15]John W. Baker, "The Relationship of Physical Fitness to Intelligence, Academic Achievements and Emotional Adjustment Among Educable Mentally Retarded Boys," (unpublished Master's thesis, University of Washington, 1964), p. 5.

[16]Harold M. Barrow, and Rosemary McGee, A Practical Approach to Measurement in Physical Education (Philadelphia: Lea and Febiger, 1964), p. 546.

[17]Kirk, loc. cit.

educable mentally retarded children in the control group, in which they participated with the seventh grade typical (normal) boys and girls, and a three day a week physical education program participated in by the educable mentally retarded children in experimental Group III.

Intelligence was defined as an idea invented to help to explain and predict behavior that can be observed. It is an abstract conceptualization of many forces and of many abilities, differing from one person to another.[18]

Intelligence Quotient, (IQ), was the ratio of a person's mental age to his chronological age $(\frac{MA}{CA})$. It is a measure of brightness that takes into account both score on an intelligence test and age.[19]

Language Master was a visual and auditory instrument used to develop basic words correlated to the material used in the Rheems' Califone. The pre-recorded card programs provide a broad range of learning situations to coordinate sight and sound stimulus.

Mental Age (MA) was defined as a specific mental age which expressed the average intellectual attainment of children of that chronological age (CA). It is a measure of the intellectual maturity of an individual.[20]

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[18]Robinson and Robinson, op. cit., p. 5.

[19]Roger T. Lennon, "A Glossary of One Hundred Measurement Terms," Test Series Notebook No. 13 (New York: Harcourt, Brace and World, Inc.), p. 3.

[20]Robinson and Robinson, op. cit., p. 386.

Motor fitness was defined as a readiness or preparedness for performance with special regard for big muscle activity without undue fatigue. It concerns the capacity to move the body efficiently with force over a reasonable length of time.[21]

Reading laboratory was an instructional environment which consisted of a console housing four tape decks and individual student stations; a Language Master and Tachistoscope utilizing instructional materials from Rheems' Califone, the Educational Developmental Laboratory Controlled Reader, and the Stereo-Reader. These instructional materials cover: Visual and auditory perceptual development through phonic series of differing types and levels, basic approach to word attack skills, comprehensive and vocabulary development, and kinesthetic training in tracing.

Stereo-Reader--Kinesthetic Technique was a technique for tracing and hand-eye coordination exercises. This device is a chiroscope which mechanically occludes one eye and permits only the eye on the same side of the body as the writing to see the stimulus target.[22]

Tachistoscope was a device which limits stimulus exposure to a very brief duration.[23]

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[21] Barrow and McGee, op. cit., p. 125.

[22] Richard L. Zweig and Muriel E. Bruno, Teacher's International Manual--Remedial Reading Laboratory (Reading Guidance Center, Inc., 1966), p. 184.

[23] Burton G. Andreas, Experimental Psychology (New York: John Wiley and Sons, Inc., 1963), pp. 272-273.

The Wechsler Intelligence Scale for Children (WISC) and Wechsler Adult Intelligence Scale (WAIS) was an individual intelligence test which measures verbal, performance, and full scale intelligence.[24]

Visual and Auditory Perceptual Reading Training was defined as a training program in a reading laboratory based on sound blending techniques, word attack methods, and kinesthetic application, and synthesized into a program which is visual, auditory, kinesthetic, tactile, and speech tactile.[25]

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[24] Robinson and Robinson, op. cit., p. 417.

[25] Zweig and Bruno, loc. cit.

CHAPTER II

REVIEW OF LITERATURE

The review of related literature presented in this chapter was categorized under three main headings: (1) Studies Related to Motor Performances of the Mentally Retarded; (2) Studies Related to Physical Fitness, Intelligence and Academic Achievement of the Mentally Retarded; and (3) Studies Related to Social and Emotional Development of the Mentally Retarded.

I. STUDIES RELATED TO MOTOR PERFORMANCE OF THE MENTALLY RETARDED

Howe[1] investigated forty-three mentally retarded and forty-three normal public school children of matched chronological ages with respect to their performances on a variety of motor skill tasks. It was found that normal boys were significantly superior in all eleven motor tasks and normal girls were significantly superior in nine of the eleven tasks. The author further concluded that physical education may be a necessary part of the curriculum for the mentally retarded.

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[1]Clifford Howe, "A Comparison of Motor Skills of Mentally Retarded Children," Exceptional Children, XXV (April, 1959), 352-354.

Beck[2] conducted a study with sixty male subjects between the ages of nine years six months and ten years six months to discover whether there was a discrimination in performances among subnormal, normal, and gifted children in measured motor proficiency. The intelligence quotient in the subnormal group was above fifty; the normal group, ninety to one hundred; and the gifted group, 130 and above. The Revised Stanford-Binet Scale was used to measure intelligence and the Beck Oseretsky Scale was used to measure motor proficiency. It was concluded that the performance of the subnormal group was significantly lower (beyond the 1 per cent level of confidence) than that of the normal or gifted group on all subtests, except Asynkinesia, which is the performance of specific movements of portions of the body without superfluous movements.

Francis and Rarrick[3] investigated certain motor characteristics of mentally retarded children and compared the motor achievement levels of the mentally retarded with normal children. The subjects included 284 mentally retarded boys and girls in special classes in the public schools. A battery of eleven gross motor tests was given to all subjects and observations were made

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[2]Robert S. Beck, "A Comparison of Performance of Subnormal, Normal, and Gifted Children on the Oseretsky Tests of Motor Proficiency," (Doctoral dissertation, Boston University School of Education, 1957), 270 pp.

[3]R. J. Francis, and G. L. Rarrick, "Motor Characteristics of the Mentally Retarded," University of Wisconsin, September 16, 1957. U. S. Office of Education Cooperative Research Project No. 152 (6432), 1960.

on age and sex trends for each skill test. In conclusion, it was stated that the mentally retarded children were markedly inferior to normal children in all motor performance tests, and that with advancing age, the deviation from the normal tended to become greater. However, the general pattern of change by age and sex was similar to that reported on normal children, as were the intercorrelations among the specific motor tests.

A study was conducted by Malpass[4] to determine whether comparable groups of fifty-two institutionalized and fifty-six non-institutionalized retarded children could be differentiated on the basis of motor proficiency, and whether the motor ability of retarded children would be distinguished from that of normal children. It was concluded that motor proficiency scores, as measured by the Lincoln Revision of the Oseretsky Motor Development Scale, did not differentiate groups of institutionalized and non-institutionalized retarded boys and girls. Highly significant differences occurred when retardates were compared with normals.

Cruse[5] studied the effects of distractions upon the performance of twenty-four brain-injured and twenty-four familial boys and girls. Reaction time response to a light stimulus was

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[4]Leslie F. Malpass, "Motor Proficiency in Institutionalized Retarded and Normal Children," American Journal of Mental Deficiency, LXIV (May, 1960), 1012-1015.

[5]Daniel B. Cruse, "Effects of Distraction Upon the Performance of Brain-Injured and Familial Retarded Children," American Journal of Mental Deficiency, LXVI (July, 1961), 86-92.

chosen to assess the effects of distraction upon the subjects' performances. In general, the brain-injured groups were not shown to be more distractable than the familial group. Brain-injured groups with definite signs of organic injury were more distractable than familial groups.

Reitan[6] investigated the reliability of differences in performance of persons with and without brain damage and comparative improvement of groups with and without brain damage on successive but anticipated repetitions of the task. The two groups consisted of thirty-nine subjects, thirty-five men and four women in each group who were matched in pairs with respect to color, sex, age, and education. The Sequin-Goddard formboard was administered individually to all subjects. The amount of time required for each of the three trials was recorded. The results showed highly significant intergroup differences in the amount of time required for each performance of the task as well as for the total time needed for the three trials. Both groups showed improvement with practice, and the intergroup differences in this respect were not statistically significant. The author concluded that persons with brain damage are capable of showing definite improvement with practice in relation to their initial performance.

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[6]R. M. Reitan, "Effects of Brain-Damage on a Psychomotor Problem-Solving Task," Perceptual and Motor Skills, IX (September, 1959), 211-215.

Bensberg and Cantor[7] studied twenty-four mentally defective subjects having an organic etiology and matched these subjects on the basis of chronological age and mental age with twenty-four subjects of familial etiology, to determine etiology influence in speed of reaction in simple and discriminative tasks. The ages of the subjects were eight to thirty-nine years. It was concluded that the familials were significantly faster than the organics on the simple tasks and in the discriminative tasks.

Thirty-nine educationally subnormal boys, ages nine and ten, were compared with eighty-four normal school boys, ages six through nine, by Keogh and Keogh[8] to determine children's ability to copy simple two-dimensional patterns by drawing and walking. It was concluded that the educationally subnormal boys were similar to six year olds on both tasks, and were significantly poorer than all other age groups. No differences between walking and drawing ability were found for the normal boys, but the educationally subnormal boys were significantly poorer in ability to walk than to draw the patterns.

Geddes[9] conducted a study to determine the influence of

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[7]G. J. Bensberg, and G. N. Cantor, "Reaction Time in Mental Defectives With Organic and Familial Etiology," American Journal of Mental Deficiency, LXII (November, 1957), 534-537.

[8]Barbara K. Keogh, and Jack F. Keogh, "Pattern Copying and Pattern Walking Performance of Normal and Educationally Subnormal Boys," American Journal of Mental Deficiency, LXXI (1967), 1009-1013.

[9]Dolores Maria Geddes, "A Determination of the Influence of

mobility patterning techniques (crawling, creeping, and walking) as compared to special physical education activities upon selected motor skills of primary educable mentally retarded children. Two groups of seven subjects each were included in the control and experimental groups. Individuals in the experimental group were taught mobility patterns in crawling, creeping, and walking, appropriate to their level of development. These same patterns were incorporated into gymnasium games and relays for this group. The control group received instruction and practice in tumbling, ball handling, self testing, trampolining, rope climbing, and simple relays. Measures of motor performances included leg power (rail-walking test), agility (an agility run), and fine manual coordination (matchstick item from the Oseretsky Test). Only in the performance of the standing broad jump were scores of the control group significantly better than those of the experimental group. Differences in the hurdle jump approached, but did not quite reach, significance. In terms of leg power, it appeared that the special physical education program contributed more than did the mobility patterning techniques. There were insignificant differences among the test items measuring the other motor abilities. For the development of these traits, both programs appeared to contribute equally.

Mobility Patterning Techniques Upon Selected Motor Skills of Primary Educable Mentally Retarded Children" (unpublished Master's thesis, Colorado State College, 1967), pp. iii-76.

Ellis and others[10] investigated eighty institutionalized mental defectives and eighty public high school students to determine skill retention. The chronological ages of the defectives were thirteen to twenty-five years with a mean of eighteen years six months and an intelligence quotient range from thirty-eight to seventy-five. The chronological ages of the normals ranged from fourteen to nineteen years with a mean of sixteen years four months. The eighty subjects in each group were assigned equally and without bias to two conditions which differed only in the length of the test and retest intervals. It was concluded that overall performances, after the five-minute rest, and after the retention intervals, were significantly better in the normals. It was further concluded that little forgetting occurred over the intervals used and comparisons between the groups did not uncover clear-cut differences.

II. STUDIES RELATED TO PHYSICAL FITNESS, INTELLIGENCE AND ACADEMIC ACHIEVEMENT OF THE MENTALLY RETARDED

Sengstock[11] compared physical fitness of mentally retarded boys and intellectually normal boys. Thirty educable mentally

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[10]Norman R. Ellis, Margaret W. Pryer, and Charles D. Barnett, "Motor Learning and Retention in Normals and Defectives," Perceptual and Motor Skills, 10:83-91, April, 1960.

[11]Wayne L. Sengstock, "Physical Fitness of Mentally Retarded Boys," The Research Quarterly, XXXVII (March, 1966), 113-120.

retarded boys were matched with thirty normal boys of comparable chronological age and another group of thirty boys of comparable mental ages. The American Association for Health, Physical Education and Recreation Youth Fitness Test Battery was administered to all groups. It was concluded that the mean performance of the mentally retarded boys was midway between the mean performance of the two normal groups.

A study was made by Auxter[12] to determine differences among intellectually typical boys and three groups of differentially diagnosed educable mentally retarded boys classified as non brain-damaged, brain-damaged, and undifferentiated on selected measures of flexibility and strength. The vertical jump was used as a test of dynamic strength and strength of grip was used to measure static strength. The tests for flexibility were ankle and hip flexions and extensions. The mentally retarded population was composed of thirty-nine differentially diagnosed educable mentally retarded boys ages nine and eleven years. The intellectually typical population was composed of twenty-five boys, nine to eleven years of age. Significant differences between means were found between intellectually typical boys and all groups of educable mentally retarded boys in the vertical jump, grip strength, and ankle flexibility in favor of the intellectually typical boys.

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[12]David M. Auxter, "Strength and Flexibility of Differentially Diagnosed Educable Mentally Retarded Boys," The Research Quarterly, XXXVII (December, 1966), 455-461.

The non brain-damaged group was superior to both the brain-damaged and undifferential group on the vertical jump.

Sontag, Baker, and Nelson[13] studied individual and group differences in mental ability and the relationships between intelligence quotient change and personality factors. The subjects were 140 children, all over twelve years of age, with a relatively complete series of Stanford-Binet Intelligence Tests and other longitudinal records from infancy through at least ten years of age. Aptitude, intelligence, apperception, personality, and interest tests were given. A personality rating scale of fourteen dimensions with a seven point scale was also applied. The following findings were reported: (1) Cycles of changes in intelligence quotients occurred in individual cases suggesting that there is no constant increment of change in intelligence quotients to be found in the majority of cases; (2) real changes in relative mental ability do occur in childhood; (3) accelerative and decelerative ratio of mental growth do not appear to be related to any specific areas of abilities as measured by the differences in performance on different types of items found in the Stanford-Binet; and (4) the various modes of personality by which children attempt to gain satisfaction in their experience appear to be of value in predicting

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[13] L. W. Sontag, C. J. Baker, and V. L. Nelson, "Mental Growth and Personality Development: A Longitudinal Study," Monographs of the Society for Research in Child Development, XXIII (1958), 1-143.

intelligence quotients, and in understanding the nature of accelerated or decelerated mental growth as related to personality factors.

Kulcinski[14] reported in a study of fifth and sixth grade boys and girls classified as superior, normal, and subnormal that (1) a relationship exists between intelligence and learning of fundamental muscular skills; (2) a relationship exists between intelligence and the degree of learning; (3) the ability to do simple skills enables one to do more difficult skills more easily.

Oliver[15] experimented with two groups of educable mentally retarded boys (intelligence quotients fifty-four to eighty-six) in two residential institutions in the United Kingdom to determine effects of physical conditioning. The two groups were matched as nearly as possible for age, intelligence, size, and physical condition. There were fourteen boys in the experimental group and twenty boys in the control group. The experimental group was given a course, extending over ten weeks, of systematic and progressive physical conditioning and recreational activities of two hours and forty minutes each day. The control group continued with their regular school program which consisted of two physical education lessons each week plus organized games. A significant improvement was

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[14]L. E. Kulcinski, "The Relation of Intelligence to the Learning of Fundamental Muscular Skills," The Research Quarterly, XVI (December, 1945), 266-276.

[15]James Oliver, "The Effect of Physical Conditioning Exercises and Activities on the Mental Characteristics of Educationally Subnormal Boys," British Journal of Educational Psychology, XXVIII (June, 1958), 155-165.

found in the intelligence test scores of the experimental group as well as improvement in their motor proficiency. It was concluded that these effects were achieved through the medium of physical activity.

Distefano, Ellis, and Sloan[16] conducted a study to determine the relationship between intelligence and motor proficiency. Seventy-six mentally defective subjects were given the Revised Stanford-Binet I Scale and several motor tests. A significant positive relationship was found between mental age and motor proficiency. However, no significant relationship was found between chronological age and motor scores.

A study was made by Sloan[17] to determine the relationship between motor proficiency and intelligence. Two groups of subjects, twenty feeble-minded boys and girls and twenty normal boys and girls, were given the Lincoln adaptation of the Oseretsky Test of Motor Proficiency. Subjects were matched for age and sex. It was concluded that motor proficiency is related to intelligence. It was further reported that normal children were significantly superior to the feeble-minded on the Vindland Social-Maturity Scale.

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[16]M. K. Distefano, Jr., N. R. Ellis, and W. Sloan, "Motor Proficiency and Mental Defectives," Perceptual and Motor Skills, XIII (June, 1958), 231-234.

[17]W. Sloan, "Motor Proficiency and Intelligence," American Journal of Mental Deficiency, LV (January, 1951), 394-406.

Rabin[18] investigated sixty boys and girls, ages ten to fourteen and with intelligence quotients ranging from forty to sixty-nine, to determine the relationship of age, sex, and intelligence quotients to motor proficiency. All subjects were obtained from two institutions. Each subject was administered the Lincoln-Oseretsky Motor Development Scale by one of two psychologists. The intelligence test, in the great majority of cases, was the 1937 Stanford-Binet. For a few children, the verbal intelligence quotient of the Wechsler Intelligence Scale for Children was utilized. It was found that chronological age is significantly related to motor proficiency, however, motor proficiency was not found to be significantly related to intelligence quotients or sex.

Gier[19] in his investigation of boys enrolled in special education classes of the public school system in Seattle reported a correlation of .332 between measurements of physical ability and the Wechsler Full Scale Intelligence Quotients.

Corder[20] studied the effects of systematic and progressive

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[18]Herbert M. Rabin, "The Relationship of Age, Intelligence and Sex to Motor Proficiency in Mental Defectives," American Journal of Mental Deficiency, LXII (November, 1957), 507-516.

[19]James D. Gier, "The Relationship of Physical Ability to Certain Psychological Scores and Ratings Among Mentally Retarded Boys" (unpublished Master's thesis, The University of Washington, Seattle, 1959), p. 54.

[20]Owens W. Corder, "Effects of Physical Education on the

programs of physical education on the intellectual development, physical development, and social status of twenty-four educable mentally retarded boys. The subjects were divided into three groups of eight each and equated on chronological age and intelligence quotient. All boys were between the ages of 12 and 16.7 years with full scale intelligence quotients on the Wechsler Intelligence Scale for Children between fifty to eighty. Eight retarded boys received four weeks of training for one hour a day. Eight retarded boys met each day with the training group and were designated as "officials". The control group of eight retarded boys remained in the classroom and received the usual classroom instruction. The training group made a significant gain over the "officials" and the control group on the full and verbal scale of the Wechsler Intelligence Scale for Children and the Youth Fitness Test. There were no differences among the three groups on mean score on social status.

Asmussen and Heeball-Nelson[21] conducted a study of 214 Danish girls and 204 Danish boys, ages seven to seventeen years, to determine the influence of sex, age, and intelligence on the development of physical capacities in growing children. The boys

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Intelligence, Physical, and Social Development of Educable Mentally Retarded Boys," Exceptional Children, XXXII (February, 1966), 357-364.

[21] E. Asmussen, and K. Heeball-Nelson, "Physical Performance and Growth in Children: Influence of Sex, Age, and Intelligence," Journal of Applied Physiology, VIII (January, 1956), 371-380.

were classified according to their intelligence quotients, all with an intelligence quotient not lower than ninety-five. The average for the entire group was 112. The subjects were divided into two groups, A and B, with intelligence quotients of one hundred as the dividing value. Sixty-two boys from a special school for retarded children with an average intelligence quotient of eighty-three were also included. The effect of age was studied by dividing each height group into two groups, a younger and older. It was found that girls were inferior to boys in strength of finger flexion and vital capacity. Age seemed to have a positive influence on physical capacities, mostly so in tests that required the highest degree of neuromuscular coordination. Intelligence, as expressed by the intelligence quotient, seemed to play no statistical significant role as long as the intelligence quotient lies above ninety. Boys with a lower intelligence quotient (average eighty-three) on the whole performed less well than normal boys.

Klausmier, Lehmann, and Buman[22] investigated the relationships among physical, mental, and achievement measures in children of the same chronological age but of low, average, and high intelligence. Forty boys and forty girls were drawn randomly from

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[22]Herbert J. Klausmier, Irwin J. Lehmann, and Alan Buman, "Relationships Among Physical, Mental, and Achievement Measures in Children of Low, Average, and High Intelligence," American Journal of Mental Deficiency, LXIII (January, 1958), 647-656.

118 children enrolled in four regular third grade classrooms, and from fifty-eight children enrolled in eleven special classes for mentally retarded educable children. The random drawing was made to fit a normal intelligence quotient curve, based on the Wechsler Intelligence Scale for Children. It was found that a low level of physical development within boys accompanies low achievement in arithmetic and reading, but the same does not hold for girls. Uneven physical development within the child (split-growth) does not accompany low achievement in arithmetic and reading. The within-child variability in strength of grip, intelligence, reading achievement, language achievement, and arithmetic achievement is not the same among children of low, average, and high intelligence.

A comparative study was made by Blatt[23] of 125 children to determine physical, personality, and academic status of children who are mentally retarded attending special classes and children who are mentally retarded attending regular classes. The seventy-five special class children were selected on the following basis: each child was in the process of completing at least two years of special class elementary education; and each was not less than eight years six months nor more than sixteen years old. The fifty regular class children were selected on the following bases: each was in a regular class; was never enrolled in a special class;

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[23]Burton Blatt, "The Physical, Personality, and Academic Status of Children Who are Mentally Retarded Attending Regular Classes," American Journal of Mental Deficiency, LXIII (March, 1958), 810-818.

and was not less than eight year six months, nor more than sixteen years old. The special class group was equated with the regular class group in chronological age, intelligence, mental age, and sex. It was found that the special class children were significantly more socially mature and emotionally stable than regular children. It was also reported that the special class children improved more academically from one year to the next than did the children in regular class. Comparisons in tests of power, as measured by the vertical jump; grip strength, as measured by the dynamometer; and motor ability, as measured by the Brown Scale, revealed no significant differences between the two groups.

Gibson and others[24] investigated 219 pupils to determine if etiological classification is relevant to academic achievement and what proportions of the three etiological groups, endogenous, exogenous, and undetermined, survive to the upper levels of the academic school. The academic material most intensively presented was in the areas of arithmetic, reading, language (grammar and composition), writing, social studies, and music. The materials were extracted from case books concerning intellectual status; etiology was determined at diagnostic conferences, years of schooling prior to hospitalization, and academic progress in each

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[24]David Gibson, Ann E. Jephcott, and Rosemary Wilking, "Academic Success Among High Grade Hospitalized Mentally Retarded Children as a Function of Intelligence and Etiological Classification," American Journal of Mental Deficiency, LXII (March, 1959), 852-859.

of the foregoing school subjects. It was concluded that egiological classification is a relevant variable to the performance of such school subjects as arithmetic, grammar, and composition (language). It was further concluded that differences occur for the predictive success of intelligence quotients per school subject depending upon the cause of mental deficiency.

Baker[25] conducted a study to determine the relationships between measures of physical fitness and measures of intelligence, academic achievement, and emotional adjustment of eighteen educable mentally retarded boys in intermediate and senior opportunity classes in a public school system in Alberta, Canada. The AAHPER Youth Fitness Test, the Non-Language Multi-Mental Test, the Stanford Achievement Test, and the Student Evaluation Scale I-B were the measuring instruments utilized to collect the data. The author reported the following conclusions: (1) The relationship between physical fitness and intelligence is positive but low; (2) among educable mentally retarded boys a positive relationship, which is low but significantly different from zero, exists between physical fitness and academic achievement; and (3) among educable mentally retarded boys a positive relationship, which is low but significantly different from zero, exists between physical fitness and emotional adjustment.

An intensive investigation consisting of a number of

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[25]Baker, op. cit., p. 60.

studies of the development of mentally handicapped children in the public schools of North Carolina was made by Thurston.[26] The areas of the children's development which were studied were gross motor skills, social development, academic achievement, and intellectual growth. Several contacts were made with each of 1300 children with an intelligence quotient from fifty through seventy-nine. Academic achievement was measured by the Stanford Achievement Tests and the Binet Test was used to measure intelligence. The battery of motor skill tests included the following items: (1) Tennis ball throw for distance, volleyball punt for distance, standing broad jump, tennis ball throw for accuracy, side stepping, forty-yard run and strength of right and left grip.

Subjects whose ages ranged from ten through fifteen years were given the same battery except a softball replaced the tennis ball in the throw for distance and a soccer ball replaced the volleyball in the punt for distance. Two procedures were used to obtain information concerning the personal-social status of each child. The first procedure utilized the sociometric technique and the second procedure used was the teacher rating of each child. The most significant generalization which was made was

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[26]Thelma Gwinn Thurston, "An Evaluation of Educating Mentally Handicapped Children in Special Classes and in Regular Classes" (Cooperative Research Project, Contract Number OE-SAE-6452, of the United States Office of Education, conducted by the School of Education, University of North Carolina, Chapel Hill, North Carolina, 1959), 245 pp.

that mentally handicapped children achieve very much less in a school than normal children of the same mental age, and achieve less than might be expected of them. It was found that social adjustments of the children studied indicated that when mentally handicapped children are in a regular classroom, they are likely to be social isolates. The mentally handicapped children in special classes seem to be better adjusted in school and to have more friends than the mentally handicapped children in the regular classes. In the gross motor skills studied, mentally handicapped children are consistently inferior in their accomplishments to normal children of comparable age. This was found to be true for both sexes and for all ages. In the area of academic achievement, it was found that these children came nearest to accomplishing their predicted scores in the arithmetic computation tasks. Spelling was another subject that showed high scores as did the arithmetic computations. It was found that intellectual development could proceed considerably beyond the age of sixteen years. It was also found that mentally handicapped children do better work in the regular classroom than they do when placed in a special class. However, it was concluded that special education is somewhat more effective with the older children than it is with the younger children.

Killinger[27] studied the effects of intensifying the emphasis

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[27]Delight Killinger, "A Study of the Effect of Intensifying

on physical fitness in a class of thirteen educable mentally retarded girls and a class of thirty normal eighth grade girls in physical education. The educable mentally retarded girls were between the ages of twelve and sixteen years. The thirty normal girls were chosen at random from a regular eighth grade class in physical education. The improvement shown by each group as a result of the fitness testing and increased emphasis was compared only within the group itself. The Iowa Test of Motor Fitness was employed to determine fitness at the beginning and end of one year. The battery of tests consisted of seven items: sit-ups, standing broad jump, shuttle-run, forward bend, grasshopper dash, and bent-arm hang. Significant improvement was found in certain fitness items in both groups due to the increased emphasis on fitness throughout the year. It was further noted there was a general overall improvement which was not found to be significant.

Cavanaugh[28] conducted a study which extended over a twenty-two week period to determine whether students who are brain-damaged and mentally retarded can profit significantly in the areas of

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the Emphasis on Physical Fitness in a Class of Educable Mentally Retarded Girls and a Normal Eighth Grade Class of Girls in Physical Education" (unpublished Master's thesis, State University of Iowa, 1963), 63 pp.

[28]John R. Cavanaugh, "A Study to Determine the Effects of a Physical Education Program of Educable Mentally Retarded and Minimal Brain-Damaged Children" (unpublished Master's thesis, Louisiana State University, Baton Rouge, Louisiana, 1968), p. 59.

motor development and physical fitness from an organized physical education program. A test battery designed to measure many physiological factors which constitute physical fitness was administered to both of the groups. It was concluded that an organized, progressive program of exercise and vigorous recreational games and activities is effective in producing significant gains in many areas of physical fitness and motor development for the educable mentally retarded and the minimal brain-damaged children.

Ismail and Gruber[29] investigated the relative contribution of the importance of coordination and balance items in the prediction of intellectual achievement, the relative effectiveness of an organized physical education program on intelligence quotients, and academic achievement pertaining to motor aptitude test items. A test manual was developed, which included thirty-seven motor aptitude items, and was used for the prediction of academic success. The intellectual performance test, the Otis Short Form Test, was used. In addition, Stanford Academic Achievement and sub-tests batteries, namely, paragraph meaning, word meaning, arithmetic reasoning, and arithmetic computation, were administered. The subjects included 122 boys and 89 girls between the ages of ten and thirteen years. These groups were established according to intelligence; namely, high intelligence group which

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[29]Ismail and Gruber, loc. cit.

had intelligence quotients of 125 and above; medium intelligence group, which had intelligence quotients of 95 to 110; and low intelligence group, which had intelligence quotients of 85 and below. The following conclusions were reported: (1) There is a relationship between intellectual achievement and certain physical performance items, and this relationship was of sufficient magnitude to permit the prediction of intellectual achievement by motor performance; (2) coordination items, balance items, and growth items were the important predictors; and (3) there is a sex difference in the predictive power of motor aptitude test items for estimating the Otis Intelligence Quotients, Stanford Academic Achievement and sub-tests, favoring the girls rather than the boys. In an attempt to validate the above findings, an experimental and control group, consisting of seventy-one subjects each, thirty-three male and thirty-eight females, between ten and twelve years of age, were investigated. It was further concluded by the authors that an organized physical education program has no effect on intelligence quotient scores. However, it has a favorable effect on academic achievement scores. It was further noted that if advancement in one area can be brought about, a similar advancement in the second area could be anticipated.

A questionnaire method of investigation was employed by Turnquist[30] to determine status of physical education programs for

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[30]Donald A. Turnquist, "A Study of Physical Education Needs

the mentally retarded in twenty-eight cities in the United States. The author also investigated and compared the motor proficiency of eleven mentally retarded pupils in a special education laboratory school with that of eleven pupils who were not mentally retarded. Motor proficiency of both the mentally normal and the mentally retarded pupils were measured by the Lincoln adaptation of the Oseretsky Test of Motor Proficiency. It was found that the physical education programs should be based on the needs and capacities of the group. Mentally retarded pupils have motor needs and capacities different from the mentally normal pupil. The author suggested that special programs of physical education are necessary for mentally retarded pupils. It was further concluded that the mentally retarded pupils tested have some significant weaknesses in motor proficiency. Out of sixty-five items of the Oseretsky tests, forty items were performed better by the mentally normal groups, and for twenty of the forty items, the superiority for the normal group was statistically significant.

Beck[31] conducted a questionnaire study of sixty-two school districts in Illinois having special education classes for

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for Mentally Retarded Pupils in Illinois Public Schools" (unpublished Master's thesis, Illinois State Normal University, 1952), 44 pp.

[31]H. S. Beck, "Present Status of Physical Education in Special Classes for the Educable Mentally Handicapped," American Journal of Mental Deficiency, LXI (July, 1956), 117-120.

educable mentally handicapped children to determine: (1) is there research being done in the school and not reported? (2) is there a felt need for research in this area? and (3) what sort of physical education programs are presently employed? It was concluded that physical education is important for educable mentally handicapped children. It was further reported by the author that (1) the schools are not doing formal research in this area; (2) the schools feel a need for research in this area; (3) although objectives are more or less agreed upon, the measures for attaining them are not.

A survey study was conducted by Brace[32] to determine the instruction in physical education for mentally retarded pupils in public schools on a nationwide basis. A four-page questionnaire was sent to 4,022 superintendents, principals, and teachers of the mentally retarded. Returns were received from all fifty states and the District of Columbia. It was reported that (1) nearly one-third of the mentally retarded pupils in the lower grades receive no instruction in physical education; (2) in junior high schools, 4 per cent reported no formal instruction in physical education, while in senior high schools the figure was 8 per cent; (3) physical education for the mentally retarded was taught in

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[32]David K. Brace, "Physical Education and Recreation for Mentally Retarded Pupils in Public Schools," Research Quarterly, XXXIX (October, 1968), 779-782.

separate classes from those for normal pupils in about half the primary and elementary schools, compared with 16 per cent and 12 per cent in junior and high schools. Some of the needs of school programs in physical education for mentally retarded pupils revealed by the survey were as follows:

1. Physical fitness testing should be increased for mentally retarded pupils.
2. There should be instruction in physical education for all pupils, especially the mentally retarded, and there should be a daily period of physical education for all pupils in public schools.
3. Instruction in swimming is especially needed for the mentally retarded.
4. There is a special need in all schools for more instruction in skills of recreation sports, bowling on gymnasium floor or in alleys, corrective exercises, musical play, racket play, swimming, and winter play where available.

III. STUDIES RELATED TO SOCIAL AND EMOTIONAL DEVELOPMENT OF THE MENTALLY RETARDED

Smith and Hurst[33] studied eighteen trainable retarded children

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[33] J. R. Smith, and J. G. Hurst, "The Relationship of Motor Activities and Peer Acceptance of Mentally Retarded Children," American Journal of Mental Deficiency, LXVI (July, 1961), 81-85.

and twenty-five educable mentally retarded children to determine the relationship between motor skills and social status. The Lincoln-Oseretsky Motor Development Scale was used to measure motor ability and peer acceptance was measured by peer contacts, verbal or non-verbal, initiated or received. It was concluded that motor ability plays a significant role in peer acceptance.

Oliver[34] reported improvement in the emotional adjustment of mentally retarded boys after a ten-week period of conentrated physical fitness training had been administered. The author concluded that the improvement in emotional adjustment was a combination of: (1) the effect of the feeling of importance that the boys must have had at having so much interest, and (2) attention centered on them.

In an investigation made by Enos,[35] pertinent information on the emotional adjustment of educable mentally retarded subjects was reported. He compared emotional adjustment with level of intelligence in 120 fourth grade public school children. The subjects were divided equally by sex into three groups: educable mentally retarded, average, and superior. Emotional adjustment scores were obtained by averaging the combined ratings of two or more psychologists. Among the boys, the educable mentally retarded

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[34]Oliver, loc. cit.

[35]Francis A. Enos, "Emotional Adjustment of Mentally Retarded Children," American Journal of Mental Deficiency, LXV (March, 1961), 606-607.

groups made the best adjustment. A correlation of .50, which was significant at the .05 level of confidence, was reported. The boys of average intelligence showed the greatest incidence of emotional maladjustment. Among the girls, however, the superior group made the best adjustment and the educable mentally retarded girls were the most maladjusted.

IV. SUMMARY OF RELATED STUDIES

Section I of this chapter was concerned with motor performance studies of educable mentally retarded children in psychology and education. The majority of the studies in this section indicated that a definite discrepancy in motor performance exists between normal (typical) children and mentally retarded children. In all but one of the studies these findings were significant in favor of the normal (typical) children.[36] The study that did not report a significant finding did report a marked difference in favor of the normal (typical) child.[37] When a special education program for educable mentally retarded children was compared to a mobility pattern technique program for educable mentally retarded children, non-significant differences were found among all but one test item; that test item being leg power. In terms of leg power, it appeared

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[36] Beck, Howe, Malpass, Keogh and Keogh, loc. cit.

[37] Francis and Rarrick, loc. cit.

that the special education program contributed more than did the mobility patterning techniques.[38]

Section II was concerned with physical fitness, intelligence quotients and academic achievement of educable mentally retarded children. All studies reported that the physical fitness of mentally retarded children was significantly below that of normal (typical) children. Investigators in several studies concluded that a relationship does exist between various motor fitness items, intelligence quotients, and academic achievement. Significant improvement in intelligence scores of educable mentally retarded children was reported in two studies after a progressive program of physical education.[39]

One study reported that mentally retarded children made more improvement academically in special education classes than did those children in regular classes.[40]

Section III was concerned with social and emotional adjustment studies. Findings in this section concluded that motor ability plays a marked role in the social and emotional adjustment of educable mentally retarded children.[41]

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[38] Geddes, loc. cit.

[39] Corder and Oliver, loc. cit.

[40] Blatt, loc. cit.

[41] Oliver, Smith, and Hurst, loc. cit.

CHAPTER III

PROCEDURE OF THE STUDY

I. OVERVIEW

Forty educable mentally retarded junior high school boys and girls enrolled in special education classes in the East Baton Rouge Parish School System were subjects in this study which was conducted during the fall and spring semesters of 1968-69 at Louisiana State University, Baton Rouge, Louisiana.

This study was designed to determine the effects of concentrated daily programs of instruction in physical education and in auditory and visual perceptual reading upon academic achievement, intelligence, and motor fitness on the forty educable mentally retarded junior high school boys and girls.

Thirty of these subjects were selected from Prescott Junior High School and were randomly assigned to one of three experimental groups, which included ten subjects (five boys and five girls) in each of the three groups of special education classes at Louisiana State University, Baton Rouge, Louisiana. A control group consisted of ten subjects (five boys and five girls) chosen at random from a special education class at Glen Oaks Junior High School. The number of subjects was reduced to thirty-eight at the termination of the study because two of the subjects

(one boy and one girl) moved out of the state. All subjects were between thirteen and seventeen years of age and Caucasian except for one Negro male subject in the control group.

The data collected included scores obtained from the Gates-MacGinitie Reading Achievement Tests, which included Vocabulary and Comprehension Tests; The Wide Range Achievement Test (WRAT), which consisted of arithmetic and spelling tests; The Wechsler Intelligence (total) Full Scale for Children and Adults; and a Motor Fitness Test which included a battery of ten motor fitness tests.

The following computations were employed in the statistical treatment of the data: (1) t-tests for correlated groups; (2) two-by-two factorial analysis of covariance used for the academic achievement scores; and (3) two-by-two factorial analysis of variance employed for the intelligence and motor fitness tests.

These statistical methods were utilized to determine the comparative effects of a concentrated program of physical education versus the existing program of physical education, presence of machines (auditory and visual perceptual reading program) versus the absence of machines (auditory and visual perceptual reading program), and the interaction of physical education and machines.

II. SUBJECTS

The number of subjects in this study was thirty-eight educable mentally retarded (EMR) junior high school boys and girls.

No subjects in this study had had organized daily physical education programs or training in auditory and visual perceptual reading previously.

Subjects in each of the three experimental groups were transported by the East Baton Rouge Parish school bus daily to the Louisiana State University, Baton Rouge campus where the study was conducted for a period of 160 minutes each morning, five days a week, for twenty-seven weeks. The subjects in the control group remained in a special education class during the regular school day at Glen Oaks Junior High School.

III. GROUP CLASSIFICATION

Experimental Group I included ten subjects (five boys and five girls) in a combined program of eighty minutes of concentrated physical education, and eighty minutes of visual and auditory perceptual reading training. The mean chronological age for the subjects in this group was 14.3 years, with a mental age of 9.08 years, and an intelligence quotient mean of 63.5.

Ten subjects (five boys and five girls) were included in Experimental Group II in a program of eighty minutes of concentrated physical education education and eighty minutes of classroom instruction. Subjects' mean chronological age in this group was 14.6 years, with a mental age mean of 9.2 years, and a mean intelligence quotient of 63.2.

Experimental Group III consisted of nine subjects (four boys

and five girls) who were included in an eighty minute program in visual and auditory perceptual reading and eighty minutes of classroom instruction. The subjects in this group had a mean chronological age of 14.3 years, a mean mental age of 9.9 years, and an intelligence quotient mean of 69.4.

The nine subjects (five boys and four girls) in the Control Group remained in a special education class at Glen Oaks Junior High School and were instructed five hours a day during a regular school day. The mean chronological age for this group of subjects was 14.7 years, with a mean mental age of 9.0 years, and an intelligence quotient mean of 61.0. Contents of instruction in the four groups are reported later in this chapter. The reasons for the unequal numbers in Groups III and IV were discussed earlier in this chapter. It can be noted further in this study that one subject (girl) in Group I was excluded from the final data collected in one of the areas tested. The subject in Group I was excluded from the Modified Harvard Step Test because of the subject's inability to reach successfully the height of the bench due to a leg handicap.

IV. TEACHING PROCEDURE

Subjects in Groups I, II, and III attended the program at Louisiana State University, Baton Rouge, five days a week, from September, 1968 to April, 1969. The program was conducted for a period of twenty-seven weeks and followed the East Baton Rouge Parish Schools' academic calendar year.

Subjects in each of the three groups rotated every forty minutes and reported to one of the three following programs: (1) the physical education program (the physical educator was also the investigator in this study); (2) the visual and auditory perceptual reading program; and (3) the classroom instructional program. The actual length of instruction in the total program was 160 minutes daily.

A rotation procedure every forty minutes was employed because of the short attention span among educable mentally retarded children. This procedure of rotation was also utilized the previous year with educable mentally retarded and brain-damaged children and found to be effective. In dividing the program in this manner, the investigator attempted to keep the interest and motivation of the subjects at their maximum.

Subjects in Group IV were instructed in the classroom during a regular school day at Glen Oaks Junior High School. These subjects were taught physical education forty-five minutes daily with the intelligently typical (normal) children in the seventh grade.

Content and Organization of the Physical Education Program

The daily physical education program was organized to meet various objectives, but specifically those of motor fitness (strength, endurance, power, speed, balance, flexibility, stamina) and competence in leisure time activities. These objectives were sought through the media of physical activities and exercise

designed to influence the physiological aspects and motor patterns of each subject. According to Kephart and Ebersole, "a motor pattern is coordinated motor behavior composed of a combination of movements adopted to serve a purpose. It is a motor generalization, allowing for a great degree of variety."[1]

Motor Fitness and Exercise Program

In an attempt to meet the stated objectives, the initial part of each day's program was divided into thirty minutes of vigorous exercise and physical activities, and ten minutes devoted to patterns of movements created by the subjects individually or in groups.

All subjects were given an individual program of various exercises and activities during the initial thirty minutes in which these activities alternated daily. Individual records and group charts were used as motivational factors. This procedure also alternated throughout the program to enhance competitive situations within the groups as well as self-competition.

During the next ten minutes of the program, the subjects engaged in patterns of movement and activities of creativity. Various pieces of equipment, which were also utilized in the preceding phase of the program, were set out by the instructor and

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[1]Marylou Ebersole, Newell C. Kephart, and James B. Ebersole, Steps to Achievement for the Slow Learner (Columbus, Ohio: Charles E. Merrill Company, 1968), p. 67.

involved such items as the following: balls (all types), bamboo sticks, ropes, tires, balance beam, circles, triangles, and squares drawn on the floor and wall. The subjects were encouraged and guided by the instructor in the creation of various movement patterns. Listed in Appendix A is the equipment used and the exercises and physical activities engaged in in the initial forty minute physical education program.

Recreational Activities, Games, Rhythms and Sports Program

The second forty minute period was devoted to participation in recreational activities, games, rhythms, and sports. Specific skill instruction for each activity, lead-up games, rules, scoring, and safety were included in this phase of the program. Limited group demonstration and verbal instruction were given in each activity. All skills were taught from a simple, concrete approach and progressed to complex skills as success and improvement were evidenced. To further reinforce the skills taught, activities previously taught throughout the study were engaged in every Friday. Modified variations of game situations were utilized to a limited degree in each activity. In activities of a dual nature, subjects of like ability were engaged as opponents. In all team sports, subjects alternated teams periodically. Class tournaments were conducted culminating each activity.

Further information on content and progression of instruction

in the physical education activity program is provided in Appendix A, page 110.

Content of the Visual and Auditory Reading Program

During the first forty minutes, five of the subjects worked with the auditory perceptual development equipment. (See Figure 1.) Twenty seven-minute tapes, beginning with the first grade level, were utilized for each of the subjects in the group. Subjects also worked fifteen minutes with the Language Master, using basic word tests correlated with material used in the Rheem's Califone and the Stereo-Reader. In the same forty minute period, five of the subjects in this group worked with the visual perceptual development equipment. The Educational Developmental Controlled Reader was used with an introduction of new words and stories. The subjects read silently, or orally, various stories.

The Tachistoscope used for perceptual speed and accuracy, using numerals, words, and phrases, was used by the subjects in this group thirty minutes per week. (See Figure 2.)

The second forty minute period the subjects switched methods and materials in the reading laboratory. These subjects were instructed by a qualified special education teacher employed as a graduate assistant and a qualified special education teacher employed in the East Baton Rouge Parish School System.

Content of Classroom Instruction (Groups II and III)

The classroom instruction was also taught in two forty

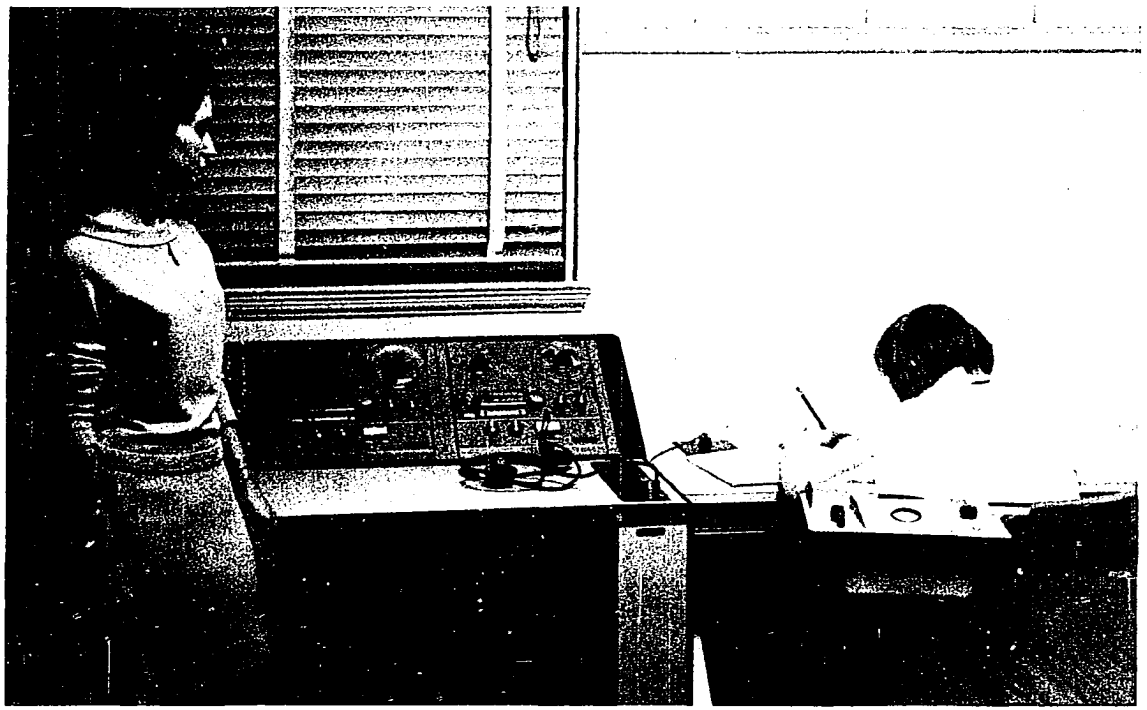

Figure 1. Special Classroom Teacher and Subject in Reading Laboratory Demonstrating the Auditory Perceptual Development Device with the Language Master in Foreground.

Figure 2. Special Classroom Teacher in Reading Laboratory Demonstrating the Tachistoscope Device.

minute sessions in the program by a qualified special education teacher employed in the East Baton Rouge Parish School System. Classroom activities instructed in the morning program were as follows: Arithmetic, Language Arts (writing, spelling, and grammer), Social Relationships, Science, and Health.

Content of Instruction in the Afternoon in Groups I, II, and III

All subjects in Groups I, II, and III returned to their respective schools in the afternoon and were instructed for forty-five minutes in Arts and Crafts and viewed films in various areas. Group I was also instructed thirty minutes in Arithmetic and Language Arts (grammar); Group II read for thirty minutes from the SRA Series (Science Research Associates); and Group III participated forty-five minutes in the following activities taught by a physical educator three days a week: basketball, folk and square dancing, creative dancing (all dancing conducted on rainy days), kickball, softball, track, trampoline, and rope climbing. Twice a week this group engaged in play which was supervised by the classroom teacher.

Content of Instruction in Group IV

These subjects were instructed during a regular school day at Glen Oaks Junior High School by a qualified special education teacher employed by the East Baton Rouge Parish School System. Subjects in this group received instruction in the following areas: (one and one-half hours) Language Arts (reading, writing, spelling,

and grammar); (one and one-half hours) Arithmetic; (one hour) Social Studies, Science and Health; (forty-five minutes) Physical Education. Arts and Crafts classes were taught in the afternoon. All subjects received limited instruction in this area due to bus transportation. The physical education program for the girls included the following activities: basketball, volleyball, tumbling, softball, and health. The following physical education activities were engaged in by the boys: basketball, tumbling, softball, soccer, and touch football. One of the boys did not participate in the school's physical education program because of a visual handicap.

V. PROCEDURE FOR ADMINISTRATION OF THE ACADEMIC ACHIEVEMENT TEST, INTELLIGENCE TEST, AND MOTOR FITNESS TEST

The Wide Range Achievement Test[2] (WRAT) and the Gates-MacGinitie Test[3] were administered to all subjects during the last two weeks in September, and again during the second and third weeks of April. All subjects were administered Level I of the Wide Range Achievement Test in arithmetic and spelling individually.

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[2]J. F. Jastak, and S. R. Jastak, The Wide Range Achievement Test--Manual of Instructions. Revised edition, 1965. Guidance Associates, Wilmington, Delaware. pp. 1-55.

[3]Arthur I. Gates and Walter H. MacGinitie, Technical Manual for the Gates-MacGinitie Reading Tests. Teachers College Press, Teachers College, Columbia University, New York, 1965. pp. 1-24.

The Wide Range Achievement Test in arithmetic was administered to each of the subjects in a ten minute period. Administration of the Wide Range Achievement Test in spelling varied in time periods for each subject depending on the number of words missed. These tests were administered according to the instructions in the test manual. Description and scoring of these tests can be found in Appendix B, page 116.

The Gates-MacGinitie Test was administered according to the instruction in the test manual in small groups. Vocabulary and Comprehension were the two tests included in the Reading Achievement Test administered. The two tests were administered in approximately a forty-five minute time period for each of the groups. A rest period of two minutes was given after each test administered.

Depending on the subject's reading readiness level, after sample tests were given, each of the subjects in the four groups was administered either Primary A or B or C or Survey D of Form I of the Vocabulary and Comprehension Reading Test at the beginning of the study. These same subjects were given the same primary levels of A, B, C, or Survey D of Form II in the Vocabulary and Comprehension Reading Test at the termination of the study.

Description and scoring of the Gates-MacGinitie Test can be found in Appendix C. The Academic Achievement Tests were administered by the special education teacher (graduate assistant)

and director of the reading laboratory) to Groups I, II, and III. Subjects in Group IV were administered the Academic Achievement Test by their special education classroom teacher. All tests were hand-scored according to the test manual instructions and results recorded for each of the subjects on each of the tests. Grade levels for each of the subject's raw scores for the initial and final data collected on all the Academic Achievement Tests given are reported in Appendix D.

Administration of the Wechsler Intelligence Scale for Children (WISC) and Wechsler Adult Intelligence Scale (WAIS)

All subjects in the study who had not been tested with the Wechsler Intelligence Scale for Children two years previous to the study were retested using the Wechsler Intelligence Scale for Children or Wechsler Adult Intelligence Scale at the beginning of the study.

The subjects in Groups I, II, and III were tested by two qualified psychologists at the Special Education Center at Louisiana State University, Baton Rouge. Subjects in Group IV were tested by a qualified psychologist employed by the East Baton Rouge Parish School System. Administration of the Wechsler Intelligence Scale was given at the termination of the study in Groups I, II, and III during a two and one-half week period. Subjects in Group IV were administered the same test in a two week period at the end of the study. The (total) full scale score

obtained on the Wechsler Intelligence Scale for Children (WISC) or Wechsler Adult Intelligence Scale (WAIS) was recorded for each of the subjects in each of the four groups.

Administration of the Motor Fitness Test

Six items included in the motor fitness test were chosen from the American Association for Health, Physical Education and Recreation Special Fitness Test Manual for the Mentally Retarded.[4] All items were presented to the subjects according to the instructions given in the manual.

Flexed Arm Hang

Each subject used an overhand grasp on a $1\frac{1}{2}$" diameter horizontal doorway bar which was adjusted approximately equal to the subject's standing height. The subject, with assistance, raised his body off of the floor to a position where the chin was above the bar, elbows flexed, and held as long as possible. One trial only was given. The score was recorded in seconds, from the time the subject hung unaided, until his chin touched or fell below the bar, or the head tilted backwards, as the measure of arm and shoulder strength.

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[4] American Association for Health, Physical Education and Recreation--Kennedy Foundation, Special Fitness Test for the Mentally Retarded. Washington, D.C.: American Association for Health, Physical Education, and Recreation, 1958. 52 pp.

Sit-Ups

This test measures the abdominal strength, endurance, and speed of the subjects. The subject lay on his back, on the mat or floor, with legs extended and feet about two feet apart. A partner held the ankles down, keeping the heels in contact with the floor. One point was given for each complete movement of touching the right elbow to the left knee and returning to the starting position and then touching the left elbow to the right knee. No score was counted if the fingertips did not remain in contact behind the head, or when the subject pushed up off the floor from the elbow. The number of sit-ups each subject executed in one minute constituted the score.

Shuttle Run

Two parallel lines were marked on the floor thirty feet apart. Placed behind one of the lines were two blocks of wood (2" x 2" x 4"). The subject started behind the starting line and ran to the blocks, picked one up and ran back to the starting line and placed the block behind the line; he then ran back and picked up the second block which he carried across the starting line. Two trials were permitted with a rest between each and the better of the two trials was recorded to the nearest tenth of a second as the measure of agility and speed.

Standing Broad Jump

This test measures the strength and power of the subject's

legs. The subject stood with feet several inches apart and the toes behind the designated take-off line. Each jump was accomplished by the subjects swinging the arms and bending the knees preceding each trial. Three trials were allowed and the measure from the take-off line to the heel or the part of the body that touched the floor nearest the take-off line was recorded in feet and inches to the nearest inch. The best of the three trials was recorded for each of the subjects.

Fifty-Yard Dash

The fifty-yard dash test was used to measure the speed of the subjects. The score was recorded in seconds, to the nearest tenth of a second, from the time the subject left the starting line until the subject crossed the finish line.

Softball Throw for Distance

This test was employed to measure the subject's arm and shoulder coordination. A twelve-inch softball was used with an overhand throw on a marked playing field. The subjects threw the ball while remaining within a restraining area of two parallel lines, six feet apart. The best of the three trials allowed was recorded for each of the subjects, measured to the nearest foot.

Modified Harvard Step Test

The Modified Harvard Step Test[5] was included to measure the cardiovascular efficiency of the subjects. A sixteen-inch bench was used in consideration of the physical size of the subjects and a cadence of thirty steps per minute was followed. Following a one minute recovery period, three one-half minute pulse counts were recorded for each subject at one minute, two minutes, and three minutes after the exercise. When the three minute limit was reached, or the subject failed to maintain the cadence, the subject was given a one minute recovery period and the initial pulse was taken at the end of this period.

The scores were calculated with data from the duration of the exercise in seconds and the sum of the three one-half minute pulse counts. The data were then placed in the following formula:

$$\text{Cardiovascular index} = \frac{\text{Length of exercise in seconds X 100}}{\text{2 X Sum of the pulse counts in the three recovery periods}}$$

This formula was used only for those subjects who failed to reach the three minute limit.

The Nelson Dynamic Balance Test[6]

This test was used to determine balance of the subjects.

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[5]Donald K. Mathews, Measurement in Physical Education (Philadelphia: W. B. Saunders and Company, 1958), 359 pp.

[6]Jack Nelson, "Nelson's Dynamic Balance Test," Louisiana State University, Agricultural and Mechanical College, Baton Rouge, Louisiana, 1968.

Nine small wooden blocks (four colored red) were used for stepping stones and a balance beam ten feet long. The time started when the subjects stepped on the first block with the left foot. When the subject stepped on the color-coded block, he balanced for five seconds before continuing on to the next block. Each subject then proceeded, leaping from one block to the next, alternating feet each time. The subject tried to go as fast as he could without making mistakes. When crossing the balance beam, the subject walked heel-to-toe. The score was the total elapsed time from start to finish, to the nearest tenth of a second. Three trials were permitted with one practice allowed. Further description of this test is given in Appendix E.

Jumping With Both Feet

This motor test was included to measure coordination and balance. The motor item was one of several tests used in a recent study by Ismail and Gruber.[7] The subject stood with both feet together and his hands on his hips. At the signal "ready; go", the subject jumped forward four times using both his feet at the same time. Removing the hand or both hands from the hips or faulty footwork each constituted an error. Four trials were allowed and two points were given for each trial, thus a total score of eight points was possible. The summation of the scores

[7] Ismail and Gruber, loc. cit.

on the four trials constituted each subject's total score on the test.

Wells Sit and Reach Test[8]

Each subject was seated on the floor with legs extended and both feet against the apparatus. The subject reached forward, palms down, along the scale for the testing apparatus. The maximum distance was recorded on the third bob as the measure of flexibility. Description of equipment used in this test is found in Appendix F.

Each of the subject's raw scores on each of the items tested in the motor fitness battery was converted to T-scores employing a T-scale with a mean of 50, and a standard deviation of 10. All subjects were administered the motor fitness test battery at the beginning of the study during the last two weeks in September, 1968 and at the end of the study, the second and third weeks of April, 1969. Subjects in Groups I, II, and III were administered the motor fitness tests in the morning, and the subjects in Group IV were administered the same tests in the afternoon. All subjects were given sufficient time to familiarize themselves with each of the tests in the battery. These test items were administered individually to each of the thirty-eight subjects by the investigator and an assistant.

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[8]Donald K. Mathews, Measurement in Physical Education (third edition; Philadelphia: W. B. Saunders and Company, 1968), 388 pp.

Statistical Treatment

The data collected for the study were derived from the academic achievement tests, intelligence tests, and a motor fitness test battery which consisted of ten motor fitness tests.

Significant differences in mean gain scores were determined for each of the four groups by the use of t-tests for correlated groups. A two-by-two factorial analysis of covariance was utilized to determine whether actual differences, if any, existed among the groups, and if so, what treatments or combination of treatments were responsible for the difference for the academic achievement scores.

Raw scores for the motor fitness test battery were converted to T-scores and a two-by-two factorial analysis of variance employed for the comparisons of the groups' motor fitness scores and comparison of the groups' scores for the intelligence test.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

I. INTRODUCTION

In order to determine the effectiveness of concentrated instruction in physical education and in auditory and visual perceptual reading (machines) on Academic Achievement, Intelligence, and Motor Fitness of thirty-eight educable mentally retarded children, the following statistical techniques were employed: (1) t-tests for correlated groups; (2) two-by-two factorial analysis of covariance used with the academic achievement scores; and (3) two-by-two factorial analysis of variance employed with the intelligence quotient and motor fitness scores.

The following three comparisons were made with the obtained scores:

1. The effectiveness of concentrated instruction in physical education versus existing program of physical education.
2. The effectiveness of concentrated instruction in auditory and visual perceptual reading (machines) versus the absence of auditory and visual perceptual reading.
3. The interaction effects of physical education and machines with regard to academic achievement,

intelligence, and motor fitness.

II. THE SIGNIFICANCE OF THE MEAN GAINS OF THE FOUR GROUPS IN ACADEMIC ACHIEVEMENT

The significance of the mean gains was established for each of the four groups by using t-tests. This statistical technique was employed to determine the differences between the means for each of the four groups in academic achievement, intelligence, and motor fitness.

The t-ratios needed for significance at the .05 and .01 level of probability with 9 degrees of freedom were 2.26 and 3.25. With 8 degrees of freedom, t-ratios of 2.31 and 3.36, respectively, were needed for significance at the .05 and .01 levels of probability.

Gates-MacGinitie Achievement Test

Results of the analysis for each of the four groups for the Gates-MacGinitie Achievement Test in reading vocabulary are presented in Table I.

Group IV (instruction in a special education class during a regular school day) had a t-ratio of 6.59 which exceeded the t-ratio needed for significance at the .01 level of probability. Therefore, it can be stated that the traditional five hour a day of instruction in a special education class resulted in significant gains in reading vocabulary.

TABLE I

SIGNIFICANCE OF MEAN GAINS FOR THE GATES-MacGINITIE ACHIEVEMENT TEST IN READING VOCABULARY FOR THE FOUR GROUPS OF EDUCABLE MENTALLY RETARDED CHILDREN (N=38)

Groups	N	Mean Gains	SE	df	t	P
I	10	2.75	1.66	9	1.66	N.S.
II	10	0.05	1.66	9	.03	N.S.
III	9	-2.38	1.74	8	-1.36	N.S.
IV	9	11.82	1.79	8	6.59	.01

t-ratio needed for significance at the .05 level of probability with 1 and 9 degrees of freedom, 2.26; for the .01 level, 3.25

t-ratio needed for significance at the .05 level of probability with 1 and 8 degrees of freedom, 2.31; for the .01 level, 3.36

Group I: Concentrated instruction in physical education and machines.

Group II: Concentrated instruction in physical education and classroom instruction.

Group III: Concentrated instruction using machines and classroom instruction.

Group IV: Instruction in a special education class during a regular school day.

The computed t-ratio for Group I (concentrated instruction in physical education and in auditory and visual perceptual reading) was 1.66, and for Group II (concentrated instruction in physical education and classroom instruction) and Group III (concentrated instruction in auditory and visual perceptual reading and classroom instruction) were .03 and 1.36, respectively, which were below that needed at the .05 level of probability. This indicated that the concentrated programs of instruction in physical education and machines (concentrated instruction in auditory and visual perceptual reading) did not significantly improve reading vocabulary when reading vocabulary was measured by the Gates-MacGinitie Achievement Test. It should be noted further that Group III (concentrated instruction in machines and in classroom instruction) regressed in reading vocabulary.

Since the analysis of the mean gains recealed significant improvement by one of the groups in reading vocabulary, further analysis was made to determine whether there were significant differences among the four groups with regard to reading vocabulary. This analysis is reported later in this chapter.

In Table II significant gains are reported for the Gates-MacGinitie Achievement Test in reading comprehension. A t-ratio of 2.47 was found for Group I (concentrated programs of instruction in physical education and machines) which was significant at the .05 level of probability; and a t of 4.13 was shown for Group IV (instruction in a special education class during a regular

TABLE II

SIGNIFICANCE OF MEAN GAINS FOR THE GATES-MacGINITIE ACHIEVEMENT TEST IN READING COMPREHENSION FOR THE FOUR GROUPS OF EDUCABLE MENTALLY RETARDED CHILDREN (N=38)

Groups	N	Mean Gains	SE	df	t	P
I	10	4.95	2.00	9	2.47	.05
II	10	2.77	1.98	9	1.40	N.S.
III	9	4.31	2.09	8	2.06	N.S.
IV	9	8.65	2.09	8	4.13	.01

t-ratio needed for significance at the .05 level of probability with 1 and 9 degrees of freedom, 2.26; for the .01 level, 3.25

t-ratio needed for significance at the .05 level of probability with 1 and 8 degrees of freedom, 2.31; for the .01 level, 3.36

Group I: Concentrated instruction in physical education and machines.

Group II: Concentrated instruction in physical education and classroom instruction.

Group III: Concentrated instruction using machines and classroom instruction.

Group IV: Instruction in a special education class during a regular school day.

school day) which reached significance at the .01 level of probability. These results indicated that the combined program of concentrated instruction in physical education and machines, and the traditional special education classroom instruction of five hours daily, were effective in improving reading comprehension.

The t-ratio of 1.40 for Group II (concentrated program of instruction in physical education and classroom instruction) and 2.06 for Group III (concentrated program of machines and classroom instruction), were not significant. This indicated that concentrated programs of physical education alone, and the concentrated program with machines alone, were not effective in improving reading comprehension as measured by the Gates-MacGinitie Achievement Test. Further analysis of these results to determine whether there were any actual differences among the four groups in reading comprehension are reported later in the chapter.

Wide Range Achievement Test (WRAT)

Results of the analysis of the mean gains for the Wide Range Achievement Test (WRAT) in arithmetic are shown in Table III. A significant t-ratio of 2.58 for Group I (concentrated programs of instruction in physical education and machines) reached significance at the .05 level of probability, and the t-ratio of 4.77 for Group IV (instruction in a special education class during a regular school day) was significant at the .01 level of probability. Group II (concentrated program in physical

TABLE III

SIGNIFICANCE OF MEAN GAINS FOR THE WIDE RANGE ACHIEVEMENT TEST (WRAT) IN ARITHMETIC FOR THE FOUR GROUPS OF EDUCABLE MENTALLY RETARDED CHILDREN (N=38)

Groups	N	Mean Gains	SE	df	t	P
I	10	2.09	0.81	9	2.58	.05
II	10	1.60	0.82	9	1.95	N.S.
III	9	1.61	0.86	8	1.87	N.S.
IV	9	4.15	0.87	8	4.77	.01

t-ratio needed for significance at the .05 level of probability with 1 and 9 degrees of freedom, 2.26; for the .01 level, 3.25

t-ratio needed for significance at the .05 level of probability with 1 and 8 degrees of freedom, 2.31; for the .01 level, 3.36

Group I: Concentrated instruction in physical education and machines.

Group II: Concentrated instruction in physical education and classroom instruction.

Group III: Concentrated instruction using machines and classroom instruction.

Group IV: Instruction in a special education class during a regular school day.

education) and Group III (concentrated program of machines) did not gain significantly in knowledge in arithmetic. These results are analogous with the previous analysis of reading vocabulary where it was found that the combined programs of concentrated instruction in physical education and machines, and a traditional special education classroom program of instruction five hours daily, improved reading vocabulary significantly in these two groups. Since the mean gains analysis revealed significant improvement had been made by two of the groups, further analyses were employed to determine whether there were any actual differences among the four groups in knowledge of arithmetic. These analyses are reported later in this chapter.

The computed t-ratio for the mean gains on the Wide Range Achievement Test (WRAT) for spelling are presented in Table IV. As visual inspection reveals, the computed t-ratios of 1.69 for Group I, .80 for Group II, 1.66 for Group III, and 1.56 for Group IV all failed to reach significance at the .05 level of probability. Consequently, none of the programs produced significant improvement in spelling as measured by the Wide Range Achievement Test. Thus, it was inappropriate to make further analyses of the four groups.

In summary, the combined programs of concentrated instruction in physical education and machines were found to be effective in improving comprehension and arithmetic knowledge. However, the traditional five hour a day of instruction in a special education

TABLE IV

SIGNIFICANCE OF MEAN GAINS FOR THE WIDE RANGE ACHIEVEMENT TEST (WRAT) IN SPELLING FOR THE FOUR GROUPS OF EDUCABLE MENTALLY RETARDED CHILDREN (N=38)

Groups	N	Mean Gains	SE	df	t	P
I	10	2.53	1.49	9	1.69	N.S.
II	10	1.20	1.50	9	.80	N.S.
III	9	2.55	1.53	8	1.66	N.S.
IV	9	2.39	1.53	8	1.56	N.S.

t-ratio needed for significance at the .05 level of probability with 1 and 9 degrees of freedom, 2.26; for the .01 level, 3.25.

t-ratio needed for significance at the .05 level of probability with 1 and 8 degrees of freedom, 2.31; for the .01 level, 3.36

Group I: Concentrated instruction in physical education and machines.

Group II: Concentrated instruction in physical education and classroom instruction.

Group III: Concentrated instruction using machines and classroom instruction.

Group IV: Instruction in a special education class during a regular school day.

class was found to be effective in improving reading vocabulary and comprehension, and arithmetic knowledge.

III. TWO-BY-TWO FACTORIAL ANALYSIS OF COVARIANCE

A two-by-two factorial analysis of covariance was used to determine if significant differences among the four groups in reading vocabulary and comprehension, and arithmetic knowledge occurred, and if so, what treatment, or combination of treatments, were responsible for the differences. Analysis of covariance technique allows for correlation between initial and final scores, and final means are corrected for any differences that may have occurred in the initial means of the tests.

Comparisons were made and computed for treatment levels of A, physical education; level B, machines; and A X B, interaction effects of physical education and machines. The data utilized in the analysis represented scores in vocabulary, comprehension, and arithmetic achievement.

The Gates-MacGinitie Achievement Tests

The results of the computations of the analysis of covariance for the comparative effects of the concentrated program of physical education versus existing program of physical education; presence of machines versus the absence of machines; and the interaction of physical education and machines are presented in Table V.

The F-ratio of 3.69 for the levels of A, the difference

TABLE V

ANALYSIS OF COVARIANCE OF IMPROVEMENT IN THE GATES-MacGINITIE ACHIEVEMENT TESTS IN READING VOCABULARY FOR THE FOUR GROUPS OF EDUCABLE MENTALLY RETARDED CHILDREN (N=38)

Source of Variance	Adjusted SS	df	M^2	F-Ratio	P
Among Subjects					
A (P.E.)	101.09	1	101.09	3.69	N.S.
B (Machines)	305.43	1	305.43	11.15	.01
A X B	659.35	1	659.35	24.07	.01
Error	903.85	33	27.38		
Total	1969.72	36			

F needed at .05 level, 1 and 33 df = 4.12
F needed at .01 level, 1 and 33 df = 7.42

Adjusted Means of Groups: Group I (concentrated instruction in physical education and machines) 2.75; Group II (concentrated instruction in physical education and classroom instruction) 0.05; Group III (concentrated instruction using machines and classroom instruction) -2.38; Group IV (instruction in a special education class during a regular school day) 11.82.

between concentrated and existing programs of physical education in improving reading vocabulary, did not surpass the F-ratio of 4.12 which was needed for significance at the .05 level of probability for one and thirty-three degrees of freedom. This indicated no significant difference in effectiveness of different programs of physical education in the development of reading vocabulary.

The F-ratio for the levels of B, the comparative effects of machines and the absence of machines upon subject's reading vocabulary, was 11.15. This exceeded the F-ratio of 7.42 which was needed for significance with one and thirty-three degrees of freedom at the .01 level of probability.

The combined means for the two groups using machines was .37, whereas the combined means of the two groups not using the machines was 11.87. Therefore, this comparison indicated that improvement in reading vocabulary was significantly greater without machines than with the machines.

A significant interaction effect, A X B, was found between physical education and machines. The F-ratio for the interaction was 24.07 which was significant at the .01 level of probability.

To interpret the interaction, the difference between the means of Group III (concentrated programs of machines), and Group IV (traditional program), was 14.20 in favor of Group IV. The difference between the means of Groups I and II, concentrated programs of instruction in physical education and machines; and

concentrated instruction in physical education and classroom instruction was 2.70 in favor of Group I. The difference between these two differences which resulted in the significant F-ratio for the interaction was 11.50. Thus, the superiority of the traditional five hour a day of instruction in a special education class over the program of classroom instruction and machines was significantly greater than the superiority of concentrated physical education and machines over concentrated physical education and classroom instruction in improving reading vocabulary.

It can be noted in Table VI that no significant differences in effectiveness of concentrated physical education versus existing programs of physical education, presence of machines versus absence of machines, nor the interaction of physical education and machines existed among the four groups in reading comprehension. All groups failed to reach significance at the .05 level of probability as indicated by the F-ratios for physical education effects (1.6), the machine effects (.27), and interaction effects (2.54). These results indicated that no treatment (or treatments) was significantly more effective than any other treatment (or treatments) in the improvement of reading comprehension.

The Wide Range Achievement Test (WRAT)

Table VII, page 75, presents the analysis for the four groups in arithmetic knowledge. As visual inspection reveals, no significant differences were found for levels A, concentrated

TABLE VI

ANALYSIS OF COVARIANCE OF IMPROVEMENT IN THE GATES-MacGINITIE ACHIEVEMENT TEST IN READING COMPREHENSION FOR THE FOUR GROUPS OF EDUCABLE MENTALLY RETARDED CHILDREN (N=38)

Source of Variance	Adjusted SS	df	M^2	F-Ratio	P
Among Subjects					
A (P.E.)	63.26	1	63.26	1.6	N.S.
B (Machines)	10.95	1	10.95	0.27	N.S.
A X B	100.23	1	100.23	2.54	N.S.
Error	1299.98	33	39.39		
Total	1474.42				

F needed at .05 level, 1 and 33 df = 4.12
F needed at .01 level, 1 and 33 df = 7.42

Adjusted Means of Groups: Group I (concentrated instruction in physical education and machines) 4.95; Group II (concentrated instruction in physical education and classroom instruction) 2.77; Group III (concentrated instruction using machines and classroom instruction) 4.31; Group IV (instruction in a special education class during a regular school day) 8.65.

TABLE VII

ANALYSIS OF COVARIANCE OF IMPROVEMENT IN THE WIDE RANGE ACHIEVEMENT TEST IN ARITHMETIC FOR THE FOUR GROUPS OF EDUCABLE MENTALLY RETARDED CHILDREN (N=38)

Source of Variance	Adjusted SS	df	M^2	F-Ratio	P
Among Subjects					
A (P.E.)	9.97	1	9.97	1.49	N.S.
B (Machines)	9.95	1	9.95	1.98	N.S.
A X B	21.41	1	21.41	3.20	N.S.
Error	220.86	33	6.69		

F needed at .05 level, 1 and 33 df = 4.12
F needed at .01 level, 1 and 33 df = 7.42

Adjusted Means of Groups: Group I (concentrated instruction in physical education and machines) 2.09; Group II (concentrated instruction in physical education and classroom instruction) 1.60; Group III (concentrated instruction using machine and classroom instruction) 1.61; Group IV (instruction in a special education class during a regular school day) 4.15.

program of physical education versus presence of physical education; levels B, presence of machines versus absence of machines; A X B, physical education and machines.

The F-ratios for physical education effects (1.4), the machine effects (1.4), and interaction effects (3.2), all failed to reach significance at the .05 level of probability.

IV. THE SIGNIFICANCE OF THE MEAN GAINS OF THE FOUR GROUPS IN INTELLIGENCE QUOTIENT AND MOTOR FITNESS

The data were analyzed to determine significance of the mean gains for each of the four groups for the Wechsler Intelligence Full Scale Test and the Motor Fitness Test Battery. In order to determine the significance of the mean gains, t-tests for correlated groups were employed.

The Wechsler Intelligence Full Scale for Children and Wechsler Adult Intelligence Scale

The resulting t-ratios revealed that significant gains were experienced by two of the groups as shown in Table VIII. These gains can be noted by the t-ratio of 2.57 for Group I and 2.72 for Group II. The t-ratios needed for significance at the .05 and .01 level of probability with nine degrees of freedom were 2.26 and 3.25; with eight degrees of freedom, t-ratios of 2.31 and 3.36 were needed for significance at the .05 and .01 levels of probability. The Intelligence Quotient scores were

TABLE VIII

SIGNIFICANCE OF MEAN GAINS FOR THE WECHSLER INTELLIGENCE FULL SCALE FOR CHILDREN AND WECHSLER ADULT INTELLIGENCE SCALE FOR THE FOUR GROUPS OF EDUCABLE MENTALLY RETARDED CHILDREN (N=38)

Groups	N	Mean Gains	SE	df	t	P
I	10	5.10	1.98	9	2.57	.05
II	10	5.40	1.98	9	2.72	.05
III	9	3.22	2.09	8	1.54	N.S.
IV	9	1.55	2.09	8	.74	N.S.

t-ratio needed for significance at the .05 level of probability with 1 and 9 degrees of freedom, 2.26; for the .01 level, 3.25

t-ratio needed for significance at the .05 level of probability with 1 and 8 degrees of freedom, 2.31; for the .01 level, 3.36

Group I: Concentrated instruction in physical education and machines.

Group II: Concentrated instruction in physical education and classroom instruction.

Group III: Concentrated instruction using machines and classroom instruction.

Group IV: Instruction in a special education class during a regular school day.

increased significantly at the .05 level for Groups I, concentrated programs of instruction in physical education and machines, and Group II, concentrated program of instruction in physical education and classroom instruction. Therefore, it can be stated that significant improvement in I.Q. as measured by the Wechsler Intelligence Scale for Children or the Wechsler Adult Intelligence Scale was found in the combined program of concentrated instruction in physical education and machines, and a concentrated program of physical education and classroom instruction.

Group III, concentrated program of machines and classroom instruction, and Group IV, traditional program, revealed t-ratios of 1.54 and .74, respectively, which indicated no significant increase in intelligence quotients for either of the two groups. Further analysis of these results is reported later in this chapter to determine whether there were any actual differences among the four groups in intelligence quotient improvements.

Motor Fitness Test Battery

Resulting t-ratios for the mean gains for the four groups on each of the motor fitness tests are presented in Table IX.

Significant gains were not made for all groups in each test. The flexed arm hang scores was increased only by Group II, program of instruction in physical education and classroom, at the .05 level. Group I, concentrated instruction in physical education and machines, and Group III, concentrated instruction

TABLE IX

SIGNIFICANT MEAN GAIN SCORES FOR THE FOUR GROUPS OF EDUCABLE MENTALLY RETARDED CHILDREN FOR THE SIX ITEMS ON THE SPECIAL FITNESS TEST FOR THE MENTALLY RETARDED, CARDIOVASCULAR EFFICIENCY TEST, NELSON'S DYNAMIC TEST, THE JUMPING TEST, AND THE WELLS SIT AND REACH TEST

Item and Group	N	Mean Gains	SE	df	t	P
Flexed Arm Hang						
I	10	7.16	3.22	9	2.20	N.S.
II	10	8.04	3.22	9	2.48	.05
III	9	.33	3.41	8	.09	N.S.
IV	9	-3.18	3.41	8	.93	N.S.
Standing Broad Jump						
I	10	5.60	2.86	9	1.95	N.S.
II	10	7.10	2.86	9	2.48	.05
III	9	2.00	3.01	8	.66	N.S.
IV	9	-9.00	3.01	8	2.99	.05
Shuttle Run						
I	10	- .73	4.79	9	.15	N.S.
II	10	-1.05	4.79	9	.22	N.S.
III	9	- .54	5.05	8	.10	N.S.
IV	9	.45	5.05	8	.90	N.S.
Fifty-yard Dash						
I	10	-1.25	.46	9	2.71	.05
II	10	- .35	.46	9	.76	N.S.
III	9	.44	.49	8	.89	N.S.
IV	9	.10	.49	8	2.04	N.S.

(continued on page 80)

TABLE IX (continued)

Item and Group	N	Mean Gains	SE	df	t	P
Softball Throw						
I	10	116.10	88.86	9	1.80	N.S.
II	10	72.50	88.86	9	.81	N.S.
III	9	62.77	93.67	8	.67	N.S.
IV	9	27.55	93.67	8	.28	N.S.
Sit-ups						
I	10	7.0	2.67	9	2.62	.05
II	10	8.1	2.67	9	3.03	.05
III	9	- 2.1	2.82	8	.74	N.S.
IV	9	- 1.1	2.82	8	.89	N.S.
Cardiovascular Efficiency						
I	9	22.67	9.53	8	2.37	.05
II	10	24.86	9.53	9	2.60	.05
III	9	- 3.56	10.05	8	.35	N.S.
IV	9	-16.54	10.05	8	1.64	N.S.
Nelson's Dynamic Balance Test						
I	10	-14.87	5.34	9	2.78	.05
II	10	-12.54	5.34	9	2.34	.05
III	9	.34	5.63	8	.06	N.S.
IV	9	4.17	5.63	8	.74	N.S.
Jumping Test (Coordination)						
I	10	2.10	3.69	9	.56	N.S.
II	10	1.50	3.69	9	.40	N.S.
III	9	1.55	3.89	8	.89	N.S.
IV	9	9.77	3.89	8	2.51	.05
Wells Sit and Reach Test						
I	10	2.00	.91	9	2.19	N.S.
II	10	3.60	.91	9	3.95	.01
III	9	- 1.22	.96	8	1.27	N.S.
IV	9	1.50	.96	8	1.61	N.S.

t-ratio needed for significance at the .05 level of probability with 9 degrees of freedom, 2.26; for .01 level, 3.25.
t-ratio needed for significance at the .05 level of probability with 8 degrees of freedom, 2.31; for .01 level, 3.36.

in machines and classroom instruction, and Group IV, traditional classroom program, showed no significant gains.

On the standing broad jump, those subjects in Group II, concentrated physical education program and classroom instruction, increased scores significantly at the .05 level. Group IV, traditional classroom program, showed a significant decrease in scores at the .05 level.

In the shuttle run, no significant improvement was made by any group.

Only Group I, combined program of concentrated instruction in physical education and machines, showed a significant increase at the .05 level for the fifty-yard dash.

No significant gains in the softball throw scores were found for any of the groups.

Significant gains at the .05 level were shown for Group I, combined program of concentrated instruction in physical education and machines, and Group II, concentrated physical education program and classroom instruction, for the sit-ups.

Groups I and II, subjects participating in a concentrated program of physical education, showed significant improvement at the .05 level for the cardiovascular efficiency test.

Significant improvement in the balance item at the .05 level was also revealed for Groups I and II, concentrated program of physical education.

Improvement was again found for those subjects who partici-

pated in a concentrated program of physical education and classroom instruction, Group II. A significant mean gain increase was found at the .01 level for the Wells Sit and Reach Test. No significant increase was found for those subjects participating in a combined program of concentrated instruction in physical education and machines. The overall pattern of non-significance was shown in Groups III and IV; concentrated program of machines and classroom instruction, and the traditional classroom program.

No significant gains for the test, jumping with both feet, were shown for Group I, combined programs of concentrated instruction in physical education and machines, Group II, concentrated programs of physical education and classroom instruction, or Group III, concentrated programs of machines and classroom instruction. Significant increase in scores was shown at the .05 level for Group IV, traditional classroom program.

Each of the items was analyzed in order to investigate what program or programs appeared most effective in improving various factors measured such as agility, balance, speed, strength, etc., included in the motor fitness battery. Further analysis of the data was made to determine whether there were any actual differences among the four groups for the motor fitness test battery. These analyses afford perhaps further insight into the programs of concentrated physical education and already existing programs of physical education, as found in this study, in regard to the

overall motor fitness of educable l mentally retarded children in each of the four groups.

V. TWO-BY-TWO FACTORIAL ANALYSIS OF VARIANCE

Analysis of variance was employed in a two-by-two factorial design to determine if significant differences existed among the four groups for the mean gains in intelligence quotient and motor fitness. Comparisons were made and computed for treatment levels of A, concentrated program of physical education; level B, machines; and A X B, interaction effects of physical education and machines.

In order to compare these effects for the total motor fitness test battery, the raw scores for each of the tests were converted to T-scores.

For the levels of A, the difference in effectiveness of a concentrated program in physical education versus existing programs of physical education in improving intelligence quotients, the F-ratio of 1.96 did not surpass the F-ratio of 4.12 which was needed for significance at the .05 level of probability. (See Table X.)

The F-ratio of 0.11 for B levels, the comparative effects of machines and the absence of machines upon subjects' intelligence quotients, were not found to be significant. Therefore, no significant difference was found between the program with machines and the programs without machines.

TABLE X

ANALYSIS OF VARIANCE OF IMPROVEMENT FOR THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN AND THE WECHSLER ADULT INTELLIGENCE SCALE FOR THE FOUR GROUPS OF EDUCABLE MENTALLY RETARDED CHILDREN (N=38)

Source of Variance	SS	df	M^2	F-Ratio	P
Among Subjects					
A (P.E.)	77.55	1	77.55	1.96	N.S.
B (Machines)	4.42	1	4.42	0.11	N.S.
A X B	9.16	1	9.16	0.23	N.S.
Error	1343.07	34	39.50		
Total	1434.20				

F needed at .05 level, 1 and 34 df = 4.12
F needed at .01 level, 1 and 34 df = 7.42

Group I (concentrated instruction in physical education and machines) 5.10; Group II (concentrated instruction in physical education and classroom instruction) 5.40; Group III (concentrated instruction using machines and classroom instruction) 3.22; Group IV (instruction in a special education class during a regular school day) 1.55.

No significant interaction effect, A X B, was found as indicated by the F-ratio of .23. Thus, it can be stated that all programs were uniform throughout in regard to intelligence quotients.

Motor Fitness Test Battery

Examination of the results of the analysis of variance for the groups on the motor fitness test battery as presented in Table XI reveals a significant F-ratio of 11.00 for level A. This F-ratio of 11.00 exceeded the F-ratio of 7.42 needed for significance at the .01 level of probability for one and thirty-four degrees of freedom. It can be noted by observing the means that the two groups, I and II, that had concentrated programs of physical education had the highest means which were 8.42 and 12.59, respectively. Groups III and IV that had a concentrated program of machines and traditional classroom instruction revealed means that showed a loss rather than a gain in motor fitness performances. Therefore, it can be stated that programs of concentrated physical education were significantly better in improving motor fitness when compared to programs with already existing programs in physical education.

No significant F-ratio was found for level B, presence of machines versus absence of machines. This indicated no significant difference in effectiveness of the programs using machines when compared to programs without machines.

TABLE XI

ANALYSIS OF VARIANCE OF IMPROVEMENT IN THE MOTOR FITNESS TEST BATTERY FOR THE FOUR GROUPS OF EDUCABLE MENTALLY RETARDED CHILDREN (N=38)

Source of Variance	SS	df	M^2	F-Ratio	P
Among Subjects					
A (P.E.)	46633570.80	1	46633570.80	11.00	.01
B (Machines)	633488.33	1	633488.33	.15	N.S.
A X B	238735.49	1	238935.49	.05	N.S.
Error	144044100.22	34	4236591.18		
Total	491335052.84				

F needed at .05 level, 1 and 34 df = 4.12
F needed at .01 level, 1 and 34 df = 7.42

Group I (concentrated instruction in physical education and machines) 8.42; Group II (concentrated instruction in physical education and classroom instruction) 12.59; Group III (concentrated instruction using machines and classroom instruction) -12.17; Group IV (instruction in a special education class during a regular school day) -11.17.

No significant interaction effect, A X B, was found between physical education and machines. The F-ratio for interaction effects was .05. This non-significant interaction effect indicated that the superiority of the concentrated programs of physical education was uniform in the presence of programs using machines and programs not using machines.

CHAPTER V

SUMMARY, FINDINGS, DISCUSSIONS, CONCLUSIONS, AND RECOMMENDATIONS

I. SUMMARY

The purpose of this study was to determine the effects of concentrated daily instruction in physical education upon educable mentally retarded subjects' academic achievement, intelligence quotient scores, and motor fitness; to determine the effects of an auditory and visual perceptual reading program upon subjects' academic achievement, intelligence quotient scores, and motor fitness; and to determine whether or not any interaction effects existed between physical education and machines (auditory and visual perceptual reading).

Subjects for this study were thirty-eight educable mentally retarded junior high school boys and girls, ranging in age from thirteen to seventeen years, enrolled in special education classes in East Baton Rouge Parish School System. Thirty of these subjects were initially selected from Prescott Junior High School and randomly assigned to one of three experimental groups, and ten subjects randomly selected initially from Glen Oaks Junior High School were included in the control group. The groups and final number of subjects in each were as follows: (1) Group I (five

boys and five girls) in a combined program of eighty minutes of organized physical education and eighty minutes of auditory and visual perceptual reading training; (2) Group II (five boys and five girls) in a program of eighty minutes of organized physical education and eighty minutes of classroom instruction; (3) Group III (four boys and five girls) in eighty minutes of classroom instruction and eighty minutes of auditory and visual perceptual reading training; and (4) Group IV (five boys and four girls) instructed in a special education class during a regular school day.

This study was conducted over a period of twenty-seven weeks, 160 minutes daily, five days a week, from September, 1968 to April, 1969, on the Louisiana State University campus in Baton Rouge, Louisiana.

Data were collected from the following tests administered during the last two weeks in September, 1968, and the third and fourth weeks in April, 1969: The Gates-MacGinitie Reading Achievement Tests, which included two tests, Vocabulary and Comprehension; The Wide Range Achievement Test (WRAT), which consisted of Arithmetic and Spelling Tests; The Wechsler Intelligence (total) Full Scale for Children and Adults; and a Motor Fitness Test, which included a battery of ten physiological tests.

Statistical analyses employed to determine the significance of the mean gains in academic achievement, intelligence quotient, and motor fitness were t-tests for correlated groups. In order to

determine the effectiveness of concentrated instruction in physical education and the existing program of physical education, the effectiveness of concentrated instruction in auditory and visual perceptual reading (machines) and the absence of machines (auditory and visual), and the interaction effects of physical education and machines with regard to academic achievement; a two-by-two factorial analysis of covariance was used, and a two-by-two factorial analysis of variance was employed for intelligence quotient and motor fitness improvements.

II. FINDINGS

The findings of this study were as follows:

1. Significant gains in reading vocabulary were found in the group with instruction in a special education class during a regular five hour per day school program. When comparisons were made, it was indicated that improvement in reading vocabulary was significantly greater without an auditory and visual perceptual reading program than with such a program. The interaction comparison revealed the superiority of the traditional five hour per day of instruction in a special education class over the program of classroom instruction and an auditory and visual perceptual reading program was significantly greater than the superiority of concentrated physical education and an auditory and visual perceptual reading program over

concentrated physical education and classroom instruction in improving reading vocabulary.

2. Significant improvements in reading comprehension and arithmetic were found in the groups that received a combined program of concentrated physical education and auditory and visual perceptual reading, and instruction in a special education class during a regular five hour a day school program. However, there were no significant differences in the amount of improvement when the groups were compared.
3. No significant improvement was made by any of the four groups in spelling performances.
4. Significant gains in intelligence quotients were found in concentrated physical education program and auditory and visual perceptual reading program, and the group that participated in the concentrated physical education program and classroom instruction. However, when comparisons were made, no significant differences were found.
5. Gains were found to be significant in the Special Fitness Test for the Mentally Retarded in the flexed arm hang, standing broad jump, and sit-ups, for the group that received instruction in concentrated physical education program and classroom instruction. Significant gains were also found for the fifty-yard dash and sit-ups for

the group that had a combined program of concentrated physical education and auditory and visual perceptual reading. No significant gains were made for the group that received instruction in concentrated physical education and classroom instruction for the fifty-yard dash, shuttle run, or the softball throw, nor for the group in a combined program of concentrated physical education and auditory and visual perceptual reading in the flexed bar hang, shuttle run, softball throw, or sit-ups. Gains were not found to be significant for any of the items for the group that received auditory and visual perceptual reading and classroom instruction, or the group that was instructed in a special education class during a regular five hour a day school program. A significant loss at the .05 level was found for those subjects that received instruction in a special education class during a regular school day in the standing broad jump.

6. Only those groups that participated in a concentrated physical education program improved significantly on the cardiovascular test.
7. Significant improvement was found in the Nelson Dynamic Balance Test for those groups engaged in a concentrated physical education program.
8. The Wells Sit and Reach Test scores were improved significantly by only those subjects participating in a concen-

trated physical education program and classroom instruction.

9. Significant gains were found only in the group engaged in the traditional classroom program for the test items, jumping with both feet.
10. Programs of concentrated physical education were found to be significantly better in improving total motor fitness when compared to existing physical education programs.

III. DISCUSSION OF FINDINGS

The results of this research were such that some broad implications can be made. However, some observations relevant to the study also necessitate discussion.

Perhaps of primary importance was the relatively small number of subjects utilized. Although it does allow for some generalizations with regard to the population, careful consideration of the small numbers should be made in the interpretation of the findings.

Another aspect was that of a superior special education teacher, as recognized by her peers, who instructed the subjects in the control group. It seemed that the special education instructors in the learning situations in this investigation were not paralleled in abilities which might have influenced the motivational endeavors of the subjects in each of the learning situations to some degree.

Although the analysis of the separate effects of physical education and auditory and visual perceptual reading did not point to superiority of these programs over others in enhancing learning

in the academic areas studied, it was evident that the combined effects of these programs produced significant improvement in both reading comprehension and arithmetic skills as was also found in the traditional program. These findings indicate that one or both of two approaches to teaching may be utilized.

In regard to the preceding, it has been noticed by leading authorities that in academic subjects that necessitate verbalized abstract concepts, reading and arithmetic reasoning have been found to be most difficult for retarded children.

According to Robinson and Robinson,[1] vocational placement and supervision, leisure time activities, and social groups for the retarded are beginning to enhance the adjustment of some mentally retarded adults, but as yet these programs have reached only a fraction of the individuals who could profit from them. Since, in this study, the programs with combined effects of concentrated physical education and auditory and visual perceptual reading conducted only 160 minutes daily evidenced approximately the same amount of significant improvement in reading comprehension and arithmetic as was found in a traditional five hour a day classroom program in special education, afternoon programs in vocational manual training should perhaps be considered in the schools.

What appeared to be difficult to explain were the results of the analysis of reading vocabulary which suggested that

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[1] Robinson and Robinson, op. cit., p. 474.

instruction in a traditional classroom program was superior to the other programs. Though no significant gains in reading vocabulary were made for the group in a program of combined effects of concentrated physical education and auditory and visual perceptual reading, significant gains were found in reading comprehension as was also found in the traditional classroom program which was cited earlier. Therefore, these results may suggest that a significant increase in reading vocabulary is not necessarily a dominant factor in increasing reading comprehension for these subjects. Many authorities have indicated that retarded children are capable of rote memorization, but in many instances they are not able to comprehend in sentence context.

Further analysis of the findings with regard to academic improvement found in the program of combined physical education which involved motor development and auditory and visual perceptual reading possibly denote an operating element which is concerned with gross movement and learning modality. Generally, agreement has been found in the literature that interaction between environment and the individual is basically a sensory-motor relationship.[2] It was noted further that skill in handling perceptual stimuli is perhaps the first step in cognition. It is the basis upon which cognition and

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[2]Jerome Hellmuth (ed.), Learning Disorders. "Neurological Organization: The Basis for Learning," Vol. 2, p. 60. Special Child Publications of the Seattle Sequin School, Inc., Seattle, Washington: Bernie Straud, and Jerome Hellmuth Company, 1966.

concept attainment are structured.[3] Usually it is conceivable to think in terms of sensory input as one conceives of how information and/or concepts may be transmitted to another person. If one observes the total child in action as he moves through space, it is apparent that the sensations he depends upon involve a combination of sensory input, visual, kinesthetic, as well as tactile. If a child is not aware of his body, its parts, and its position in space relative to objects, it is doubtful if he can be expected to formulate more complex judgments in many classroom learning tasks.[4]

Consequently, the combined efforts of perceptual stimuli in programs that receive both concentrated physical education involving motor movement and auditory and visual perceptual reading (machines) might possibly explain the significant improvement made in this group in reading comprehension and arithmetic skills.

Significant improvement in spelling was not found in any of the groups in this study. Perhaps this finding supports Robinson's[5] thesis that retarded children make less use of verbal mediators in their silent thought processes, and the employment of their words is poorly formulated and communicated in ideas.

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[3] Ibid., p. 48.

[4] Bryant J. Cratty, "The Perceptual-Motor Attributes of Mentally Retarded Children and Youth," Monograph, Mental Retardation Services Board of Los Angeles County, (August, 1966).

[5] Robinson and Robinson, op. cit., p. 470.

The finding that revealed significant improvement in I.Q. in the group engaged in concentrated physical education program and classroom instruction concurs with findings in other investigations of mentally retarded children which suggested progressive programs of physical education, involving games, can enhance intelligence to a significant degree. A further suggestion resulting from this finding might be that the factor of learning ability is not a single or unitary ability.[6] This does not imply that physical education per se contributed directly to cognitive process improvement. However, it could support the suggestion by Cratty[7] that success, in observable and easily measurable indices of success, contributes to various components of intellectual endeavors.

The significant improvement in I.Q. found for the group which participated in a combined program of physical education and auditory and visual perceptual reading could indicate that those subjects exposed constantly to a concentrated program in physical education in conjunction with auditory and visual perceptual reading machines might benefit by improvement in their neurological pathways for learning in certain academic areas.

It was found that the groups that engaged in concentrated

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[6]Hellmuth (ed.), op. cit., p. 130.

[7]Bryant J. Cratty, "Movement and Intellect," Speech to Education Majors and Faculty, School of Education, San Diego, California (June, 1967), p. 5.

programs of physical education improved significantly in more of the items in the motor fitness battery, such as cardiovascular efficiency, balance, and sit-ups, to name a few, than did either of the groups who did not participate in this program.

When comparisons were made for the total motor fitness battery, those subjects who participated in a concentrated physical education program were found to improve significantly as compared to those engaged in programs which did not receive instruction in a concentrated physical education program. This finding is in agreement with recent investigations wherein an organized, progressive program of physical education can improve fitness of mentally retarded children.

An opportunity to make subjective observations was afforded the author who instructed these subjects during this investigation. One observation, which appeared pertinent, was elicited through the subjects' needs for immediate success in each task presented. This was found to be consistent in all endeavors throughout this study. Though this factor perhaps is true for normal (typical) children, it is much more pronounced with the mentally retarded child. If immediate success was not encountered, frustration was the result and further attempts were futile.

It was also observed by the author that gross movement patterns seemed to influence the acquisition of skills as well as the introduction of skills in these simple units.

Another observation, which perhaps is analogous to the

preceding one, was rapidity with which some skills seemed to be learned, especially in the activities of archery, golf, and tennis. These skills were introduced in certain sequences of individualization on alternating days. When the activity was encountered at the second meeting, the majority appeared to perform well with varying degrees of success. This, perhaps, may be attributed to the fact that activities participated in on alternating days seemed to invoke more interest than those activities engaged in daily. The exceptions to this were the activities of gymnastics, trampoline, swimming, and touch football. It was further noticed that participation by the instructor seemed to enhance the learning situation to a greater degree.

When competition (self or group) was introduced in the motor fitness and exercise programs, the author observed that more interest was created. Higher interest and enjoyment were observed during this phase of the program wherein the individuals rotated from one station to another to perform given exercises.

The opportunity for expression in the free movement phase of the program appeared to stimulate the subjects' realization of independence in performance and facilitate better social relationships.

Cooperation among the boys and girls was prevalent throughout the study. Those subjects who did not display as high a level as others in some activities were given consideration and help by the group members. Constant teacher appraisal and knowledge of abilities by each subject seemed to be most important. Recognition of good

performance was acknowledged, but verbal praise was kept to a minimum for those subjects who performed consistently well. It was knowledgeable to the author that self-satisfaction and pride in execution appeared to be sufficient when the subject himself became cognizant of a good performance.

Though all activities seemed to be enjoyed by the majority, those activities that appeared to be most enjoyable to all were gymnastics, trampoline, badminton, archery, golf, and swimming. Creative dance appeared to be enjoyed the least, and especially by the boys. It perhaps might be better for the boys and girls to be separated at these ages for the instruction of dance to become more appealing.

IV. CONCLUSIONS

Findings in this study seemed to warrant the following conclusions:

1. Physical education does not contribute significantly to improvement in selected academic areas.
2. No significant improvement was made in the academic areas studied in an auditory and visual perceptual reading program.
3. Improvement in reading vocabulary was significantly greater without an auditory and visual perceptual reading program than with such a program when comparisons were made.
4. Intelligence quotients, as measured in this study, can be significantly improved in concentrated programs of physical education.

5. No significant increases in intelligence quotients were made in an auditory and visual perceptual reading program.
6. Programs of concentrated physical education specifically designed for educable mentally retarded children are significantly better in improving total motor fitness than are existing physical education programs.
7. Significant improvement in the academic areas of reading comprehension and arithmetic can be made in a combined program of concentrated physical education and auditory and visual perceptual reading.
8. The traditional five hours of instruction in a special education class was significantly better when comparisons were made than other programs studied in improving reading vocabulary.
9. In the academic areas of reading comprehension and arithmetic the traditional five hour a day school program revealed significant improvement.

V. RECOMMENDATIONS

The author recommends the following for further research:

1. A longitudinal study to determine further effectiveness of these programs with adequate consideration given to the quality of the instructors in each of the programs.
2. An investigation of social relationships as well as academic achievement, intelligence quotients and motor fitness, with this same design.

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APPENDIXES

APPENDIX A

CONTENT AND PROGRESSION OF INSTRUCTIONAL PROGRAM

Motor Fitness and Exercise

The following activities were alternated daily in a circuit method of participation: Sit-ups, push-ups, standing and running broad jump, vertical jump, balance beam walking (eyes opened and closed), tire rolling, hopping and bouncing, dodge ball, rope climbing, weight lifting, treadmill walking and running (progressively increasing speed and incline), iso-meton, target throwing with balls and darts, medicine ball throw, bar hang, pull-ups, running leap for height and distance, jump turns, skipping, hopping, running (combination of locomotive movements), duck, crab, seal, and wheelbarrow walk, forward and backward rolls in tucked and picked positions), handsprings, floor splits, head and hand stands, rope skipping (straight and rebound skipping), squat thrusts, standing and floor calisthenics involving flexibility, strength, power, speed, endurance, and balance.

Content and Progression of Physical Education Activity Program

1. First and second week

   Instruction in Volleyball (team sport)

   Skills: Serving, spiking and setting up

   Instruction in Swimming (individual sport). Swimming alternated with the team activities during the first month of the program, one day a week.

   Skills: Breath holding, rhythmic breathing, jellyfish

float, prone float, prone glide, back float, back glide, finning and flutter kick, elementary backstroke, changing of positions and directions, American crawl stroke, diving and underwater swimming.

Intermediate swimming skills: Breast stroke, side stroke, back crawl, and turns, diving from the one and three meter springboards.

II. Third Week

Instruction in Bounce Ball (team sport similar to volleyball, except the ball is allowed to bounce when serving and throughout the game. The net is lowered to approximately waist height).

Skills: Same as volleyball.

III. Fourth Week

Instruction in Kick Ball (team sport)

Skills: Throwing, catching, kicking, and running. On Friday, volleyball was engaged in for forty minutes.

IV. Fifth Week

Instruction in Gator Ball (team sport involving combination of skills and rules of touch football, soccer, and basketball).

Skills: Dribbling with both feet, partner dribble, drop-kicking, catching, and trapping the ball. on Friday the first period was devoted to volleyball and the second period was devoted to bounce ball.

V. Sixth Week

Instruction in Touch Football (team sport)

Skills: Kicking, catching, tagging, passing, centering the ball, and blocking. On Friday Kickball was engaged in for forty minutes.

VI. Seventh and Eighth Weeks

Instruction in Field Hockey and Track, on alternating days. (Team and individual sports).

Field Hockey Skills: Dribbling, driving, tackling, and bullying.

Track Skills: Running in forty and fifty-yard dashes (starting positions), exchanging a baton in relays, throwing a discus and shot put (body positions), and running broad jump. On Friday of the seventh week, touch football was engaged in during the first period and the second period was devoted to gator ball. On Friday of the eighth week, bounce ball was engaged in for forty minutes.

VII. Ninth and Tenth Weeks

Instruction in Badminton (dual sport)

Skills: Serving, underhand, overhead, and smooth strokes, singles and doubles play. On Friday of of the tenth week, field hockey was engaged in the first period, and track the second period.

VIII. Eleventh Week

Instruction in Basketball

Skills: Dribbling, passing, shooting, and guarding.

IX. Twelfth Week

Basketball and Badminton were engaged in on alternating days. On Friday of the twelfth week, kickball was engaged in during the first period and volleyball the second period.

X. Thirteenth Through Fifteenth Weeks

Instruction in Gymnastics and Trampoline

Balance Beam Skills: Crotch seat mount, walking, turning, front scale, and jump dismount.

Horizontal Bar Skills: Skin the cat forward and backward, back hip circle, and single knee circle forward.

Trampoline (boys and girls) Skills: Walking, bouncing, controlled stopping, partner bouncing, knee drop, seat drop, back drop, front drop, tuck and pike bounce,

half pirouette, front and back somersaults, half twist to front drop. Combination of these movements.

Rings--Still Rings (boys and girls) Skills: Skin-the-cat, tuck position dismounting, pike position dismount, inverted handstand, crab basket, forward roll dismount.

Vaulting (boys and girls) Skills: Squat vault and flank vault with and without the beat board.

Parallel Bar (boys only) Skills: Straight arm support, forward roll to straddle seat, and side swing dismount.

Uneven Parallel Bar (boys and girls) Skills: Shoot over low bar from hang on high bar, straight arm support, skin-the-cat, single leg swing up, and back pullover mount.

Rope Climbing Skills: Standing position with cross leg method and sitting position.

On Friday of the fourteenth week, the first period was devoted to touch football and gator ball was engaged in during the second period.

On Friday of the fifteenth week, basketball was engaged in during the first period, and the second period was devoted to gator ball.

XI. Sixteenth and Seventeenth Weeks

Instruction in Creative Dancing, Darts, Putting (golf), and Ping-Pong (individual and dual sports and rhythms). Darts, putting, and ping-pong alternated days during the two weeks with creative dancing. Putting was instructed indoors on an improvised green constructed of a wooden base covered with felt.

Skills of Dart Throwing: Throwing and accuracy.

Skills of Ping-Pong: Grip, forehand and backhand strokes.

Skills of Putting: Grip, stance and accuracy.

Skills of Dancing: Many of the movements were

incorporated from the daily exercise program, including tumbling. All movement was instructed to the rhythm of modern jazz and popular music, and included those of various parts of the body.

On Friday of the sixteenth week, gymnastics and trampoline activities were engaged in during the first and second periods.

On Friday of the seventeenth week, badminton was engaged in during the first period and the second period was devoted to trampoline.

XII. Eighteenth and Nineteenth Weeks

Instruction in Archery, Shuffleboard and Deck Tennis (individual and dual sports). Shuffleboard and deck tennis alternated days with archery.

Skills of Archery: Stringing the bow, stance, nocking, drawing the bow, sighting, releasing and retrieving the arrow.

Skills of Deck Tennis: Grip, catch, serve, and return.

Skills of Shuffleboard: Aim and delivery.

On Friday of the eighteenth week ping-pong, darts, and bounce ball were engaged in during the first period and the second period was devoted to badminton and trampoline.

XIII. Twentieth and Twenty-first Weeks

Instruction in Golf, Tennis, and Stick Dance (individual and dual sports and rhythms).

Skills of Golf (Woods): Grip, stance, and driving.

Skills of Tennis: Grip, backhand, forehand, and driving.

Skills of Stick Dancing (Tinikling): Two or four bamboo poles were used and they were struck together in a steady rhythm. Leaping and jumping between the poles individually and with partners was performed by both girls and boys. Clockwise and counterclockwise movements were engaged in

outside as well as between the poles. Subjects alternated striking the poles together.

On Friday of the twentieth week archery was engaged in during the first period, and the second period was devoted to bounce ball.

On Friday of the twenty-first week volleyball was engaged in during the first period, and shuffleboard and trampoline the second period.

XIV. Twenty-second and Twenty-third Weeks

Instruction in Bowling and Softball on alternating days.

Skills in Bowling: Grip, approach, delivery, and aiming.

Skills in Softball: Batting, catching, throwing, fielding and running.

On Friday on the twenty-second week the first period was devoted to gymnastics, and the second period was devoted to golf.

On Friday of the twenty-third week tennis was engaged in during the first period and badminton the second period.

APPENDIX B

THE WIDE RANGE ACHIEVEMENT TEST (WRAT)

The Wide Range Achievement Test (WRAT) is a test designed for use with children between the ages of five years to adulthood. The two tests consisted of Spelling and Arithmetoc.

SPELLING

Words are dictated and fifteen seconds is allowed per word.

Scoring

One point is given for each correct word written. Maximum score is fifty-one for the test.

ARITHMETIC

This part of the test is composed of an oral and a written part. The oral part is administered individually, and the written part may be administered in groups.

The oral part of the sub-test consists of:

1. Counting fifteen dots.
2. Reading five digits.
3. Showing three and eight fingers.
4. Telling which number is more: Nine or six; forty-two or twenty-eight.

5. Three oral addition and subtraction problems. The written part consists of forty-three computation problems.

Scoring

The total possible arithmetic score for both the oral and written parts is sixty-three points (twenty points included in the oral part and forty-three points included in the written part).[1]

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[1] J. F. Jastak, and S. R. Jastak, The Wide Range Achievement Test Manual of Instructions. (Revised edition, 1965). Guidance Associates, Wilmington, Delaware, pp. 1-55.

APPENDIX C

ACADEMIC ACHIEVEMENT TESTS

The Gates-MacGinitie Reading Tests are tests designed to cover grades one through twelve and consists of two parts: Vocabulary and Comprehension.

THE VOCABULARY TEST

This part of the test samples the student's reading vocabulary. This test contains fifty items, each consisting of a test word followed by five other words, one of which is similar in meaning to the test word. The student's task is to choose the word that means most nearly the same as the test word.

THE COMPREHENSION TEST

This section of the test measures the student's ability to read complete prose passages with understanding. It contains twenty-one passages in which a total of fifty-two blank spaces have been introduced. The student must decide which one of the five completions best conforms to the meaning of the whole passage.

Scoring. All answer sheets were scored by hand. The raw score on either the Vocabulary or Comprehension Test is the total number of items for which the student chose the right answer.[2]

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[2]Arthur I. Gates, and Walter H. MacGinitie, Technical Manual for the Gates-MacGinitie Reading Tests, Teachers College, Columbia University, New York, 1965. pp. 1-24.

APPENDIX D

GRADE LEVELS IN VOCABULARY, COMPREHENSION, ARITHMETIC AND SPELLING ACHIEVEMENT TESTS FOR THE THIRTY-EIGHT SUBJECTS USED IN THIS STUDY

	Vocabulary Test		Comprehension Test		Arithmetic Test		Spelling Test	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
GROUP I: CONCENTRATION OF INSTRUCTION IN PHYSICAL EDUCATION AND IN AUDITORY AND VISUAL PERCEPTUAL READING								
1	2.1	2.6	1.9	2.5	4.2	4.5	2.3	2.6
2	2.3	1.5	1.8	2.2	1.2	1.4	2.3	3.0
3	4.4	6.0	6.5	5.3	3.2	4.5	6.5	7.2
4	4.9	4.3	*	1.8	2.1	2.8	5.7	6.3
5	4.8	4.2	5.1	4.0	3.9	4.5	4.7	4.2
6	2.5	2.7	1.7	1.7	3.2	3.6	3.0	3.2
7	6.0	6.2	7.6	10.6	3.9	5.5	5.0	5.7
8	2.7	3.2	2.3	3.2	2.6	2.8	1.3	1.6
9	0.0	1.4	0.0	1.5	2.6	2.8	1.3	1.6
10	3.7	3.7	3.1	4.5	3.9	3.9	5.3	5.3
GROUP II: CLASSROOM INSTRUCTION AND CONCENTRATION OF INSTRUCTION IN PHYSICAL EDUCATION								
1	3.3	2.8	3.4	3.7	3.6	3.9	3.7	3.2
2	1.3	1.6	1.4	2.3	1.0	3.2	Kg.7**	2.6
3	1.9	1.6	1.8	2.3	3.2	3.2	1.3	2.6

APPENDIX D (continued)

	Vocabulary Test		Comprehension Test		Arithmetic Test		Spelling Test	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
4	1.7	1.7	1.5	1.9	Kg.9**	2.6	1.4	1.8
5	3.6	3.3	4.0	4.3	3.9	3.9	3.0	3.0
6	3.2	2.8	2.2	3.1	3.6	4.2	3.2	3.2
7	1.9	2.2	1.5	2.0	2.6	3.0	2.0	2.3
8	1.9	1.8	1.8	2.5	3.0	3.6	1.6	2.0
9	2.6	3.1	2.6	3.6	3.2	3.2	2.2	3.2
10	2.6	2.5	2.2	1.5	3.9	4.2	3.2	3.5
GROUP III: CLASSROOM INSTRUCTION AND CONCENTRATION OF INSTRUCTION IN AUDITORY AND VISUAL PERCEPTUAL READING								
1	5.8	4.5	4.8	5.3	4.7	5.2	5.3	4.7
2	2.3	2.4	2.1	2.4	3.2	3.2	2.3	2.6
3	1.5	1.5	1.5	1.5	1.0	2.2	1.3	1.6
4	1.7	1.4	1.6	1.5	3.2	3.6	3.2	2.2
5	2.7	2.6	2.3	2.5	2.2	3.2	1.5	3.2
6	2.3	2.0	1.8	3.1	3.2	3.0	1.5	3.0
7	3.9	2.6	1.4	2.7	2.4	2.8	2.3	2.6
8	3.5	3.1	1.3	3.3	3.0	3.0	7.7	8.2
9	2.2	2.4	3.0	2.3	4.2	4.7	2.0	2.5

APPENDIX D (continued)

	Vocabulary Test		Comprehension Test		Arithmetic Test		Spelling Test	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
GROUP IV: TRADITIONAL INSTRUCTION IN A REGULAR FIVE HOUR A DAY OF SPECIAL EDUCATION CLASSES (CONTROL GROUP)								
1	3.2	3.6	2.8	4.5	3.2	5.0	5.3	5.7
2	1.6	4.4	1.7	3.7	3.2	4.7	2.9	3.2
3	3.6	4.4	4.5	5.0	3.6	5.0	4.7	5.0
4	2.8	4.6	2.0	4.3	3.9	4.7	3.7	3.7
5	2.5	3.5	1.9	2.8	2.8	3.2	3.5	3.2
6	3.0	4.2	2.3	4.5	3.2	4.5	3.7	4.2
7	1.3	2.0	1.4	1.7	3.0	3.0	1.4	1.7
8	1.3	3.1	1.5	2.2	3.6	4.7	1.6	2.2
9	1.5	2.5	1.6	1.5	3.2	3.9	2.7	2.9

* Raw scores obtained on the Gates-MacGinitie Comprehension Test fell below grade level 1.2.

** Kindergarten

APPENDIX E

NELSON'S DYNAMIC BALANCE TEST[3]

Equipment

Nine small wooden blocks, used for stepping stones, and a balance beam ten feet long.

Directions

When ready, subject steps on the first block with left foot. The time begins when foot is placed and the tester begins the count. (The tester counts aloud, 1-2-3-4-5, to signify five seconds. This count is repeated as the subject mounts each red block. When the subject steps on a color-coded block, he balances for five seconds before continuing on to the next block.) The subject then proceeds, leaping from one block to the next, alternating feet each time. The subject tries to go as fast as he can without making mistakes. There are three more "five second hold" blocks, where the subject must balance on one foot while the tester calls out the five seconds. When crossing the balance beam, the subject must walk heel-to-toe.

Fault and Penalties

Anytime the subject's foot touches the floor, he must go

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[3]Jack Nelson, Nelson's Dynamic Balance Test," Louisiana State University, Agricultural and Mechanical College, Baton Rouge, 1968.

back to the block at the place where he fell off and proceed from there. If the subject should leave one of the "hold" blocks before the five seconds have elapsed, the subject must return and "hold" for the remaining time. Similarly, if the subject deviates from the heel-toe walk across the balance beam, he must return to that point where the fault occurred and resume the walk in the correct form. In all cases, the stop watch continues to run until the end of the last "five second hold" count at the finish of the course.

APPENDIX F

WELLS SIT AND REACH TEST[4]

Equipment

The equipment consists of a 24" x 28" piece of plywood with lines drawn horizontally at $\frac{1}{2}$-inch intervals. The center line is marked 0, the inch lines on one side are numbered one up, and those on the opposite side are numbered from minus one up. The support for the scale is in the form of a plus sign made of eleven inch boards resting on their edges.

Directions

When the subject is seated on the floor with feet against the testing apparatus, the zero line coincides with the rear surface of the crossboard and the minus values are toward the subject. The subject reaches forward, palms down, along the scale.

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[4]Donald K. Mathews, Measurement in Physical Education (third edition; Philadelphia: W. B. Saunders Company, 1968), 368 pp.

VITA

The author was born in New Orleans, Louisiana on January 11, 1932. She received her elementary and high school education in New Orleans, Louisiana.

The Bachelor of Science degree, with a major in Physical Education, and a minor in Social Studies, was awarded in 1954 by Northwestern State College in Natchitoches, Louisiana.

The author was employed as a physical education teacher at LaGrange Senior High School in Lake Charles, Louisiana. After six years of teaching she returned to Northwestern State College, Natchitoches, Louisiana, and earned her Master of Science degree in Physical Education, in August, 1961. She remained at LaGrange Senior High School until May, 1967.

In June, 1967, the author entered the Louisiana State University Graduate School to begin work on the doctoral level, with major emphasis in Physical Education and a minor in Special Education. During the period of graduate study, the author was employed as a Graduate Teaching Assistant with teaching responsibilities of educable mentally retarded children and brain-damaged children.

She was awarded the Doctor of Education degree at the August commencement, 1969.

EXAMINATION AND THESIS REPORT

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Major Field: Physical Education

Title of Thesis: The Effects of a Concentrated Physical Education Program and An Auditory and Visual Perceptual Reading Program Upon Academic Achievement, Intelligence, and Motor Fitness of Educable Mentally Retarded Children

Approved:

J. C. Drury
Major Professor and Chairman

Max Goodrich
Dean of the Graduate School

EXAMINING COMMITTEE:

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Evelyn R. Clark

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Frances H. Beck

Date of Examination:

July 16, 1969